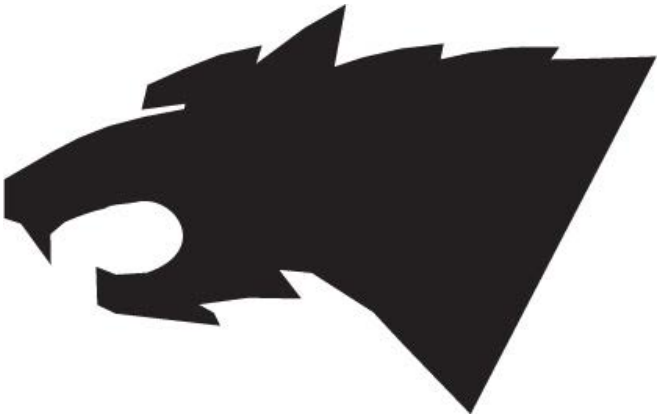
2013

INSTRUCTION MANUAL
BK SERIES
ALL-DIESEL KRACKER™

Hot Rubberized



Crack Filling Machine

BearCat Mfg., Inc.
3650 Sabin Brown Road
Wickenburg, AZ 85390
Phone: (928) 684-7851
Fax: (928) 684-3241

Rev September 10, 2013

Unit Serial Number: _____

Date of Service: _____

Customer: _____

www.bearcatmfg.com

This manual describes the BK Series All-Diesel Kracker™ as it is normally delivered to the user. Due to a continuing program of product improvement, changes may be made in equipment delivered at a later date. Every attempt is made to keep users fully informed of such changes.

WARRANTY AND CLAIM PROCEDURES

LIMITED WARRANTY

BearCat Mfg., Inc. (hereinafter referred to as “BearCat”) extends to the original purchaser-user of the BK Series All-Diesel Kracker™, the following warranty covering goods manufactured by BearCat and subject to the following qualifications.

The warranty applies only when the product:

1. Is properly used and maintained in accordance with BearCat instructions, governing agencies or associations.
2. Is being operated under proper fuel and/or cargo specifications.
3. Is not subjected to corrosive or abrasive atmosphere or materials.
4. Has not been damaged through malice or ignorance.
5. Has not been subjected to flood, lightning, accidents, misuse, neglect or unauthorized modification, repair, or service.

Parts replaced under this warranty are warranted only through the remaining time of the original warranty.

BearCat warrants that at the time of delivery, the product manufactured by BearCat and delivered new to the original purchaser-user shall be free from defects in material and workmanship for a period of one (1) year after delivery. This warranty is valid when the product is operated and maintained under normal use and service and in accordance with the written instructions provided by BearCat.

Warranty Claims

BearCat agrees at its option, to repair or replace F.O.B. Wickenburg, Arizona, any part acknowledged by BearCat to be defective, provided:

1. The user shall notify BearCat of any defect within this warranty no later than fifteen (15) days after a defect is discovered.

2. Written or verbal authorization has been obtained from the BearCat Service Department to return the product.

3. Upon authorization, the defective part is returned within thirty (30) days to the address provided below for inspection with transportation charges prepaid to BearCat.

BearCat Mfg., Inc.
3650 Sabin Brown Road
Wickenburg, AZ 85390

Phone: (928) 684-7851
Fax: (928) 684-3241

4. BearCat determines the defective part failed under the terms of the above warranty.

5. Warranty coverage will not be applied unless the requirements listed above are met.

BEARCAT WILL NOT INSTALL AND WILL NOT PAY ANY INSTALLATION COST, TRANSPORTATION COST, TRAVEL TIME, MILEAGE, LABOR COSTS OR OTHER EXPENSES OF ANY DEFECTIVE PARTS REPLACED OR REPAIRED UNLESS THE USER HAS REACHED A PRIOR AGREEMENT WITH BEARCAT.

EXCLUSIONS

The provisions of the foregoing warranty are BearCat's sole obligation and exclude all other warranties, expressed or implied.

BearCat shall not be responsible for any loss, damage, incidental or consequential damages of any kind, whether based upon warranty, contract or negligence, arising concerning the sale, use, or repair of the product.

Components manufactured by any supplier other than BearCat shall bear only the warranty made by the manufacturer of that product.

INTRODUCTION

This manual describes the BK Series All-Diesel Crack Sealing machines manufactured by BearCat. The machines are identified by the proprietary term Kracker.

BearCat BK Series All-Diesel Krackers are designed and manufactured to ensure personal safety when the equipment is operated properly and all safety precautions are strictly followed.

Persons responsible for the operation and field maintenance of the BK Series All-Diesel Kracker should read this manual carefully before attempting to operate the equipment or performing any service or adjustment procedures on it.

NOTE: BearCat Manufacturing assumes no liability for accident or injury incurred through improper use of this equipment.

WARNING: **BEARCAT EQUIPMENT USES VOLATILE MATERIALS AT HIGH TEMPERATURES AND PRESSURES. THIS EQUIPMENT EMPLOYS HIGHLY COMBUSTIBLE OR EXPLOSIVE FUELS. POTENTIALLY LIFE-THREATENING HAZARDS MAY EXIST DURING EQUIPMENT OPERATION. PERSONS MUST BE TRAINED AND FAMILIAR WITH SECTION 2 (SAFETY PRECAUTIONS) BEFORE OPERATING BEARCAT EQUIPMENT.**

WARNING: **POTENTIALLY LIFE-THREATENING HAZARDS MAY EXIST DURING EQUIPMENT OPERATION. ONLY QUALIFIED PERSONS SHOULD ATTEMPT TO OPERATE, SERVICE, OR MAKE ADJUSTMENTS TO THE BEARCAT EQUIPMENT.**

WARNING: **FOLLOW THESE PRECAUTIONARY INSTRUCTIONS EXACTLY. DO NOT TAKE SHORTCUTS. DO NOT ASSUME THAT SOMEONE ELSE HAS ACTED ON YOUR BEHALF. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN DEATH OR SERIOUS INJURY. IF ANY RULE OR PRECAUTION IS NOT CLEAR TO YOU, SEE YOUR SUPERVISOR BEFORE USING THE MACHINE.**

WARNING: **THE MATERIALS USED IN THE BK SERIES Kracker ARE NORMALLY HEATED FROM 300˚F TO 450˚F DURING APPLICATION. MATERIALS USED AT THESE TEMPERATURES CAN CAUSE SERIOUS OR FATAL BURNS AND CAN BECOME EXPLOSIVE UNDER CERTAIN CONDITIONS. DIESEL FUEL USED IN THE BURNER TO HEAT THESE MATERIALS IS HIGHLY FLAMMABLE. EXTREME CARE MUST BE EXERCISED AT ALL TIMES TO ENSURE THE SAFETY OF PERSONS WORKING IN PROXIMITY TO THESE POTENTIALLY HAZARDOUS CONDITIONS.**

Abbreviation/Definition Table

BTU ..... British Thermal Unit
CCW ..... Counterclockwise
CFM ..... Cubic feet-per-minute
CW ..... Clockwise
PSI ..... Pounds-per-square-inch
RPM ..... Revolutions-per-minute

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Equipment Description

BearCat BK Series All-Diesel Krackers™ use a diesel engine as their power source and an enclosed, high-pressure, diesel fuel burner for heating the asphalt sealing material. No gasoline, propane, or other fuels are used in BearCat machines identified as "All-Diesel." Two models are described in this manual:

- BK-250D
- BK-400D

The BK-250D has a 250-gallon sealant tank and the BK-400D has a 400-gallon tank. Both models are identical in performance and operation except where noted.

The following description of the equipment should be read to familiarize the operator with the features and capabilities of the BK Series All-Diesel Kracker.

BK-250D

BK-400D

Hydraulic System

The Kracker hydraulic system is powered by a 3-cylinder diesel engine. The hydraulic system dual-vane hydraulic pump is direct coupled to the diesel engine crankshaft. The hydraulic system is used to drive the two circulating augers, the heat-transfer oil pump, and the product pump.

Hydraulic Pump

Hydraulic fluid for the system is stored in the hydraulic reservoir. The hydraulic fluid is drawn from the reservoir through a suction strainer and gate valve to the dual-vane hydraulic pump

Circulating Augers

The hydraulic line from the forward output port of the dual-vane hydraulic pump is connected to the directional control valve for the dual circulating auger motors.

Hydraulic fluid is sent from the circulating auger directional control valve to the auger motors attached to the front of the product tank. The directional control valve is equipped with an internal bypass circuit to allow hydraulic fluid circulation without placing a load on the hydraulic system when the auger motors are stopped.

The auger motors are connected in series and are designed to rotate at the same speed. The circulating augers are also configured to rotate in opposite directions. This enhances sealant material circulation and heating within the product tank and produces a swirl effect in the material. The directional control valve allows proportional speed control and either forward or reverse rotation of the circulating augers. Hydraulic fluid is circulated through the auger motors and back to the directional control valve.

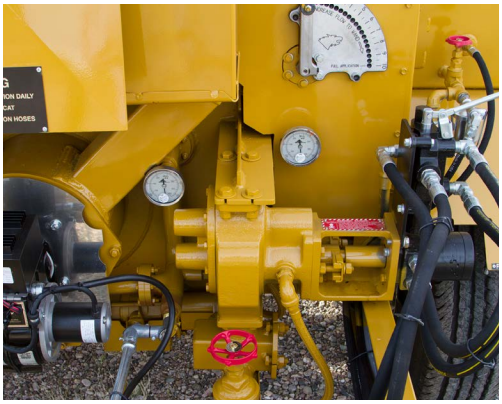
Circulating Augers inside Heat Coiling

Hydraulic fluid from the circulating auger directional control valve is returned to the hydraulic manifold assembly. The hydraulic fluid from the hydraulic manifold passes through the 10-micron filter and gate valve and back into the hydraulic reservoir.

Product Pump

The product pump and hydraulic motor are located at the rear of the Kracker. The priority valve secondary hydraulic circuit is used to operate the product pump. Hydraulic fluid is sent from the priority valve secondary output to the product pump directional control valve.

The product pump directional control valve directs the flow of hydraulic fluid to the product pump hydraulic motor. The directional control valve allows proportional speed control and either forward or reverse rotation of the product pump. Hydraulic fluid from the product pump hydraulic motor is circulated back to the product pump directional control valve. The hydraulic fluid is sent from the directional control valve to the hydraulic manifold assembly. The hydraulic fluid from the hydraulic manifold passes through the 10-micron filter and gate valve and back into the hydraulic reservoir



Heat-Transfer Oil Pump

The hydraulic line from the rear output port of the dual-vane hydraulic pump is connected to the priority valve. The priority valve separates the hydraulic fluid flow into two circuits. The first, or priority circuit, drives the hydraulic motor for the heat-transfer oil (hot-oil) pump. The second hydraulic circuit operates the product pump hydraulic motor.

The priority valve is also equipped with a relief valve. The relief valve allows excess hydraulic fluid to circulate back to the reservoir through a separate bypass line connected to the hydraulic manifold assembly without placing a load on the hydraulic system.

Hydraulic fluid from the priority valve primary circuit is sent to the hot-oil bypass valve. During normal sealing operations, the hot-oil bypass valve is set in the RUN (closed) position. With the hot-oil bypass valve closed, full hydraulic fluid flow is sent to the hot-oil pump hydraulic motor to maintain constant hot-oil circulation. This allows optimum heat transfer to the sealant material.

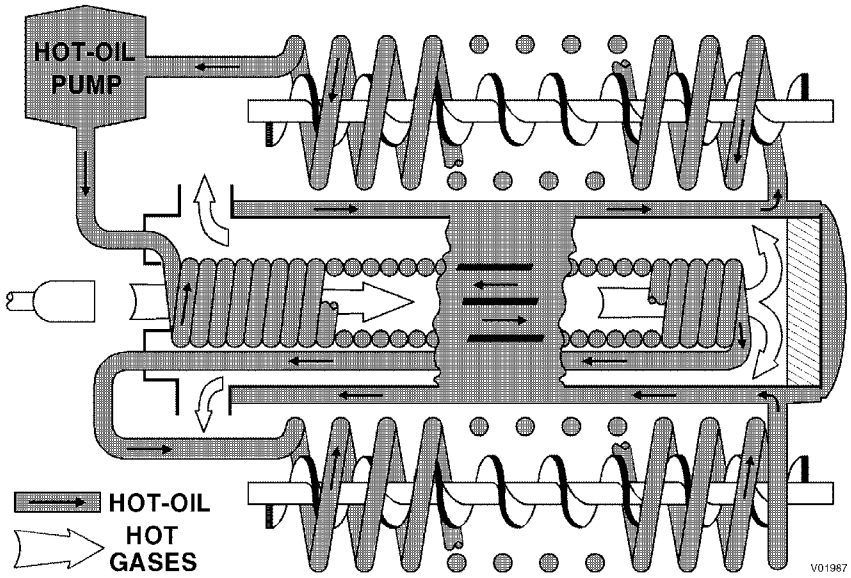
Hydraulic fluid from the hot-oil pump hydraulic motor is returned to the hydraulic manifold assembly. The hydraulic fluid from the hydraulic manifold passes through the 10-micron filter and gate valve and back into the hydraulic reservoir.

When the hot-oil bypass valve is in the STOP (open) position, hydraulic fluid is allowed to circulate through the hydraulic manifold assembly and the hot-oil pump does not operate. The hydraulic fluid passes through the hydraulic manifold assembly, the 10-micron filter and gate valve, and back into the hydraulic reservoir. Kracker startup and shutdown procedures are performed with the hot-oil bypass valve in the STOP position.

Sealant Heating System

The Kracker sealant heating system is a closed, controlled, flow heating system which utilizes a high-pressure diesel fuel burner to heat the heat-transfer oil (hot-oil). Diesel fuel for the burner is drawn from the Kracker fuel tank. The hot-oil is circulated through the heating system by the hot-oil pump. Heat transfer from the

hot-oil is used to heat the sealant material to the temperature necessary for application. The system-designed, hot-oil circulation rate eliminates any localized hot spots within the hot-oil system.



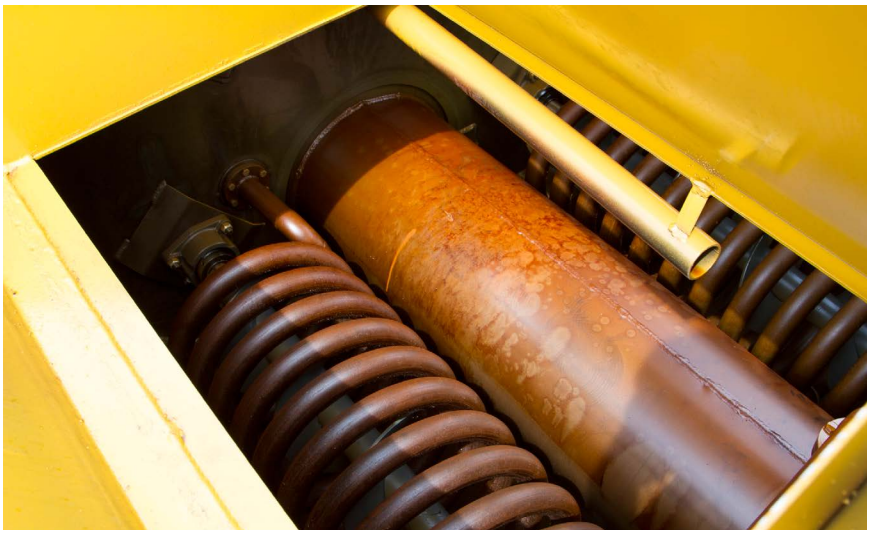
The elimination of hot spots within the heating system reduces hot-oil breakdown and product coking on the heating coils.

The sealant heating system completely isolates the sealant tank from any direct contact with the hot gases produced by the burner. The primary heating coil is surrounded by a heating chamber. The heating chamber is enclosed by a hot-oil filled outer jacket (heat jacket). All heat-related contact with the sealant material is accomplished through the Kracker sealant heating system.

The hot-oil from the sealant heating system is also circulated through a heat trace system used to heat the hose trough, the product pump, and product related plumbing.

The diesel fuel burner is a sealed, self-contained unit. The burner contains an integral high-pressure diesel fuel pump, a solid-state igniter, and a cage type blower. The diesel fuel is pressurized to approximately 150 psi and injected into the burner head through an atomizing nozzle. The atomized fuel is ignited and the hot gases are forced out of the burner by the blower.

The diesel fuel burner blows the hot gases through the inside of the hot-oil filled primary heating coil. The direct heat from the burner provides the initial heat transfer to the hot-oil system. The primary heating coil is surrounded by the heating chamber, which contains the hot gases after they exit the heating coil. When the hot gases exit the end of the heating coil they are deflected back over the outside of the heating coil by a refractory material bulkhead, which closes the end of the heating chamber. Circulating the hot gases over the outside of the heating coil provides additional heat transfer to the hot-oil.



Heating Chamber and Coils surrounding Mixing Augers

The heating chamber is constructed with a hot-oil filled outer heat jacket. The hot-oil is circulated through the heat jacket to provide additional heat transfer to the hot-oil and indirect heating to the sealant material. By containing the hot gases in this manner, near maximum theoretical heat transfer from the burner to the hot-oil is accomplished. The hot gases circulate through the heating chamber and exit through two exhaust stacks at the rear of the Kracker.

The hot-oil is pumped through the primary heating coil into the right-hand circulating auger heating coil to heat the sealant material. The circulating auger heating coil turns are spaced to allow melted sealant material to flow through them. However, large pieces of un-melted sealant material cannot pass between the coils and jam the rotating auger blades.

Circulating Auger Heating Coil

The hot-oil is circulated through the circulating auger heating coil and back into the heat jacket. The hot-oil is circulated through the heat jacket for additional heat transfer to the hot-oil. The hot-oil exits from the left side of the heat jacket and is circulated through the left-hand circulating auger heating coil to provide sealant material heating in the left side of the sealant tank.

The BK-400D has an additional heat transfer coil in the forward portion of the sealant tank. The added sealant material heating capability ensures fast and efficient heating operation with the larger capacity sealant tank.

The hot-oil is circulated from the left-hand auger heating coil and into the hot-oil manifold assembly. The hot-oil pump draws the hot-oil from the manifold assembly and begins the heat transfer and circulation cycle again.

The sealant heating system uses a hot-oil expansion tank located on top of the sealant tank to contain the hot-oil as it is heated. The hot-oil expansion tank has a capacity equal to half the volume of the total filled system. The tank contains a sight glass for both hot and cold oil level checks. The tank uses an integral cold seal to minimize oxidation of the hot-oil during

system cooling cycles. The hot-oil expansion tank is connected to the upper portion of the manifold assembly and is the final component in the closed-loop sealant heating system. A fill connection for servicing the sealant heating system and a vent is located at the top of the tank.

Temperature Control

The Kracker temperature control panel is located on the right side of the machine. The temperature control panel contains the following controls and indicators:

- Burner ON/OFF switch
- Beacon switch
- Partlow sealant temperature control
- Hour meter

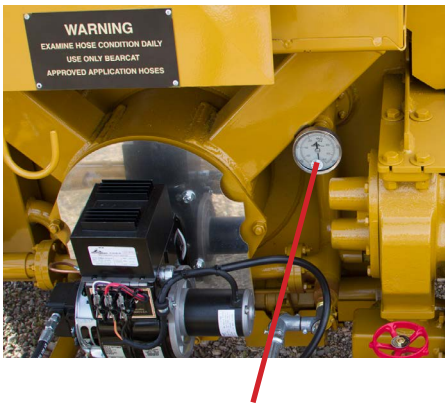
As part of the Kracker safety system, the sealant heating system requires five separate inputs before the diesel fuel burner can operate. If the burner is operating and any of the required inputs are removed, the burner shuts down. When the temperature control system cycles to the burner OFF condition, the burner fuel pump is immediately shut off. This ensures raw fuel is never pumped into the burner chamber. The burner inputs are listed below.

- Ignition switch
- Burner ON/OFF switch
- Hot-oil pressure switch
- High limit switch
- Partlow sealant temperature control

The five switches are wired in series and are routed through the control panel. If any of the switches are open, the circuit is broken and the burner cannot ignite. Only the ignition switch, burner ON/OFF switch, and Partlow sealant temperature control are operable by the user.

When the ignition switch is ON, the burner ON/OFF switch is energized. Positioning the burner ON/OFF switch to ON allows the rest of the system to energize, provided the necessary input conditions are met. With the burner ON/OFF switch in the ON position, a one-minute burner startup delay is initiated. The startup delay is for the igniter preheat system. Cycling the burner switch OFF and ON restarts the one-minute delay. Wait a full minute before attempting to restart the burner.

The hot-oil pressure switch requires a minimum pressure of 4-psi within the hot-oil system to close. With the ignition ON and the engine running, the hot-oil bypass valve must be closed enough for the heating system to build the minimum hot-oil system pressure. Loss of pressure (valve open) shuts down the burner.



The high limit switch is a thermal switch with contacts that expand as the hot-oil temperature increases. When the hot-oil temperature reaches the factory preset value (normally 500˚F) the switch opens and the burner shuts down. When the hot-oil temperature drops approximately 5˚F, the high limit switch contacts close and allow the burner to ignite. The temperature gauge for the hot-oil system is located at the rear of the Kracker.

The Partlow sealant temperature control is manually set by the operator. The correct temperature setting (set point) is determined by the sealant manufacturer's recommendation. The Partlow sealant temperature control receives temperature input through a mercury-filled capillary tube connected to a thermal-sensing element located in the sealant tank. When the sealant material within the sealant tank reaches the set

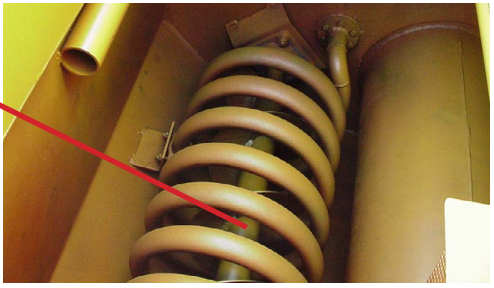
point, the Partlow sealant temperature control switch opens, and the burner is shut down. When the sealant material temperature drops approximately 5˚F, the Partlow sealant temperature control switch closes and allows the burner to ignite.

The sealant material retains heat much longer than the hot-oil. During normal operation, the hot-oil temperature may drop as much as 100˚F before the sealant material temperature drops enough to allow the burner to ignite. These temperature differences cause the burner to cycle on and off at different intervals.

Sealant Tank and Circulating Augers

WARNING: DO NOT LOAD SEALANT MATERIAL INTO THE SEALANT TANK WITH BOTH LOADING DOORS OPEN. HOT SEALANT WILL SPLASH OUT OF THE OPEN DOOR. HOT SEALANT CAN CAUSE SERIOUS OR FATAL BURNS.

The Kracker has two sealant loading doors on the top of the sealant tank. The sealant loading doors are accessible from the sides of the machine. Each sealant loading door has a loading shelf attached to the inside of the door. The loading shelf keeps the block of sealant material from falling into the sealant tank until the door is closed. This design prevents hot sealant from splashing out of the tank during material loading. The sealant loading doors are equipped with DOT-approved safety latches for transportation of elevated temperature materials. The safety latches may also be locked for added safety or security reasons.

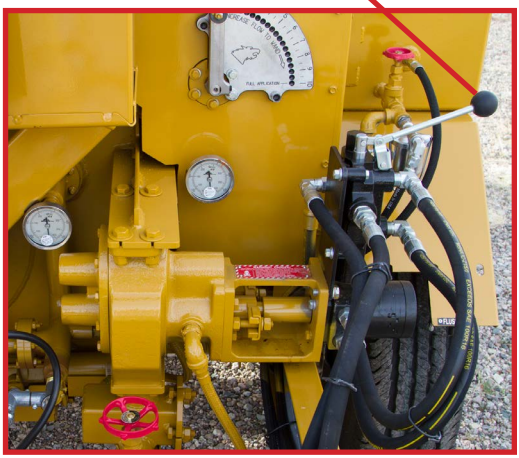


The sealant tank contains two hydraulically driven circulating augers. The circulating augers rotate inside the circulating auger heating coils. The design assures splash-free horizontal circulation of the

sealant material within the tank. The heating coils prevent blocks of unmelted sealant material from jamming the circulating augers. The circulating auger shaft is equipped with a leak-proof, high-temperature, packing gland. The special packing gland reduces the need for periodic repacking and prevents sealant leakage during operation.

Sealant Plumbing

The product pump is a positive-displacement pump, which is driven by the product pump hydraulic motor. The product pump directional control valve is used to set pump rate or speed, and direction (forward/reverse). Hot-oil from the sealant heating system is circulated through the product pump heating jacket. The hot-oil is also used to heat the product tank valve, the tank and pump drain valve, and related plumbing. Any frozen sealant material within the pump and plumbing is liquefied by the hot-oil heat trace system. The product pump is mounted in an inverted position, which allows the pump to be drained of any residual material for maintenance purposes. The product pump contains a pressure relief valve. The pressure relief valve prevents any damage to the product pump in case of a plumbing system blockage.



The product tank valve is located at the rear of the product tank, next to the product pump. The product tank valve controls the sealant material flow from the product tank to the sealant plumbing. The valve is operated by a handle connected to an extension shaft at the rear of the Kracker

Once the sealant material is melted enough to allow circulation, the product pump directional control valve is positioned to start the product pump. The product pump circulates the sealant material through the sealant plumbing.

The sealant material flow through the sealant plumbing is controlled by the application/recirculation valve. The application/recirculation valve is a

3-way valve with a detent selector used to adjust sealant circulation through the plumbing. The application/recirculation valve can be set from the "0" position (full tank circulation) to the "10" position (full flow to the application wand). The application/recirculation valve allows constant sealant material flow through the sealant plumbing system to eliminate any frozen sealant-related blockages. Continuous sealant material circulation also maintains sealant material consistency.

With the application/recirculation valve in the "0" position, all sealant material is circulated back into the sealant tank. With the application/recirculation valve moved to approximately the "10" position, maximum sealant material flow is directed to the application wand.

Sealant Application Wand

The sealant material is pumped through a 20-foot long, high-temperature hose to the application wand. The hose has a high-temperature outer cover to protect it from the heat trace lines located inside the hose trough. The aluminum application wand is connected to the hose with a swivel joint to prevent binding and permit tangle-free operation. The application wand has two insulated

handles and an insulated section between the handles. The rear handle of the application wand is also the application wand shutoff valve. The shutoff valve is a 1/4-turn, ball-type valve, which allows precise control of the sealant material during application.

The Kracker is equipped with an application wand return tube. The return tube allows continuous circulation of the sealant material through the application wand and back into the sealant tank. Circulating hot sealant material through the application wand and hose eliminates any frozen sealant material blockage problems during sealing operations. Place the application wand in the return tube and open the shutoff valve when the sealant wand is not in use. The application wand retaining bracket, located below the return tube, secures the application wand during wand-to-sealant tank circulation. As an aid to safe operation, the application wand cannot be installed or removed from the retaining bracket unless the shutoff valve is in the CLOSE position.

Hose Trough (Optional)

The application wand and hose are stored in the hose trough during transportation and initial sealant material heating. The heated hose trough contains heat trace lines from the sealant heating system. Hot-oil from the sealant heating system is circulated through the hose trough heat trace lines to heat the application wand and hose. The hose trough is insulated and is constructed with a flexible access cover to help retain the heat. The heated hose trough is capable of melting the residual frozen sealant material within the application wand and hose in a minimum amount of time.

The hose trough is designed to allow sealant material circulation through the application wand and hose while the application wand is positioned in the hose trough. Two cutouts in the side of the hose trough provide clearance for the application wand handles. The cutout for the rear handle has a retaining bracket for the shutoff valve. For safety purposes, the application wand shutoff valve must be in the CLOSE position before the wand can be removed or placed in the hose trough. The hose trough connects to an opening in the side of the left-hand sealant loading door. When the application wand is placed in the hose trough, the nozzle is positioned

inside the sealant tank. Once the sealant material is hot enough to circulate, the application wand shutoff valve is opened to allow sealant circulation through the application wand.

Specifications

FRAME	6-in. channel iron side rails, square tubular cross members, all-welded construction
AXLE	Dual, 7,000-lb rated load axle with rubber torsion suspension
BRAKES	
Standard	Electric, includes cab servo
Optional	Hydraulic, surge-actuated
TIRES AND WHEELS	LT235/85R16 (E) highway tread tires, 6.75 X 16.5, 8-hole BC wheels
TONGUE JACK	5,000-lb, side-mounted, top-wind, swivel jack with base plate
HITCH TONGUE	Pintle or ball, height adjustable from 16 in. to 32 in.
SAFETY CHAINS	3/8-in. X 48-in. high-test chain with a combined working load limit of 10,800 lbs with chain shackles
SEALANT TANK	
Tank – BK-250D	250-gallon capacity, 3/16-in. steel plate, all-welded construction
Tank – BK-400D	400-gallon capacity, 3/16-in. steel plate, all-welded construction
Sealant Loading Doors	21-in. X 36-in. insulated doors on each side of the tank, positioned at a 30° angle for ease of opening Splash-proof hinged lids with integral loading shelf Meets all DOT requirements for 49 CFR, part 172 and 173 loading height: 48 in.

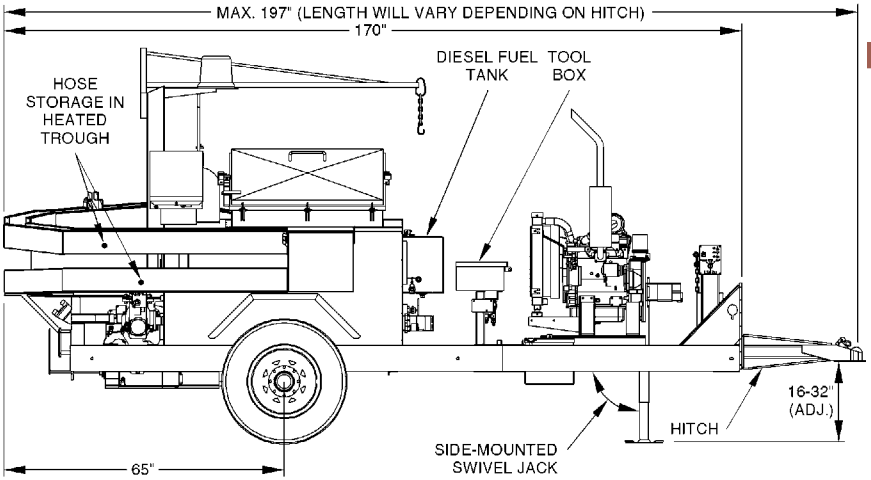
Insulation	2-in. thick mineral wool panel insulation (equal to 3 1/2 in. of fiberglass at 400˚F), moisture absorption rate less than 1%Wrapped with 16-gauge hot roll steel
Circulating Augers	Two hydraulically driven, right-hand spiral, circulating augers, one on each side of the sealant tank
Packing Glands	High-temperature, leak-proof, packing gland on each end of the auger shafts
SEALANT PLUMBING	
Product Pump	2-in. positive-displacement pump with hydraulic, bi-directional, variable speed control
Circulation Plumbing	3-way valve allows variable circulation of sealant material to tank or through the application wand
Material Screen	Located below pump intake, prevents any foreign objects from entering pump mechanism Accessible for daily clean out
Application Wand and Hose	Insulated hose enclosure heated by heat trace portion of hot-oil system Capable of heating and clearing a clogged hose
Hose Trough	Insulated hose enclosure heated by heat trace portion of hot-oil system Capable of heating and clearing a clogged hose
Wand Return Tube	Located at rear of unit, allows continuous circulation of sealant through application wand into tank when sealant is not being applied
Wand Lockout	Secures application wand in return tube or hose trough Prevents wand removal with application valve open
Hose Boom	6-ft removable boom swivels around the unit to support the hose
FLUSH-FREE SYSTEM	
Heat Tracing	Product pump, inlet plumbing, tank valve, and hose trough are heat traced with hot-oil The heat trace liquefies material in sealant lines, hose, and pump when hot-oil is heated
Flushing Requirement	No solvent flushing is required with heat trace system
HOT-OIL HEAT EXCHANGER	
Heat Exchanger	Primary heating coil and heating chamber Entire heating system is located below 100-gallon level of sealant tank
Flame Contact	Flame contact heats primary heating coil and inner surface of oil-jacketed heating chamber Total contact area: 7,000 sq in.

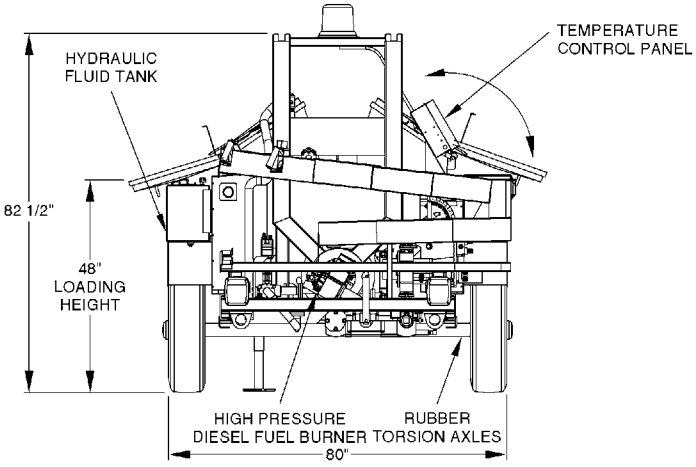
Heat Transfer Area	Heat transfer area consists of two circulating auger heating coils, outer portion of oil-jacketed heating chamber, and heat trace plumbing Minimum heat transfer area: 7,700 sq in. The BK-400D contains an additional heating coil in the forward portion of the sealant tank
Hot-Oil Pump and Plumbing	Positive-displacement pump provides forced circulation of hot-oil through heating system Forced circulation prevents premature hot-oil breakdown, which reduces heating efficiency
Hot-Oil	Standard, approved, paraffin-base, heat-transfer oil with a maximum operating temperature of 600°F in a closed, forced circulation system System capacity: BK-250D – 14 gallons BK-400D – 17 gallons
Expansion Tank	Equipped with fill connection, vent, and overflow line Cold seal system prevents oxidation of hot-oil Capacity: 1/2 of total system capacity (7 or 8 1/2 gallons)
TEMPERATURE CONTROL PANEL	Burner ON/OFF switch, beacon ON/OFF switch, Partlow temperature control, hour meter
BURNER AND CONTROLS	
Burner	Forced-air diesel-fired burner, 500,000 BTU/hr output Uses an electrically heated injection nozzle that preheats the fuel prior to ignition to prevent burner backfire
Heat Shield	Protects the coil and motor from burner chamber heat convection
Burner Fuel	Draws diesel fuel from Kracker fuel tank through a separate sediment filter and shutoff valve
Burner Controls	The burner ignition, fuel pump, and blower motor interlock with five switches: • Ignition switch • Burner switch • Hot-oil pressure switch • High limit switch • Material temperature control
ENGINE CONTROL PANEL	Ignition switch (with preheat position), glow plug indicator, temperature warning light, alternator charge warning light, and oil pressure warning light
ENGINE	25 HP, 1.1 liter, 3-cylinder diesel engine Electric start, hour meter, rainproof muffler, 12 V DC battery, and 60 A alternator

DIESEL FUEL TANK	Capacity: BK-250D – 24 gallons BK-400D – 35 gallons
HYDRAULIC SYSTEM	
Hydraulic Pump	Dual-vane hydraulic pump with 1.39 cu in. and 0.60 cu in. displacement sections
Circulating Auger Motor	Two bi-directional, variable speed, 9.6 cu in. displacement hydraulic motors with built-in relief valve
Product Pump Motor	Bi-directional, variable speed, 9.6 cu in. displacement hydraulic motor with built-in relief valve
Hot-Oil Pump Motor	0.47 cu in. displacement, priority flow valve with built-in relief to enable the operator to stop or run the pump at the desired speed
Hydraulic Reservoir	Configured with a divider, fill, vent, drain connection, suction strainer, return line filter, and shutoff valve Capacity: BK-250D – 24 gallons BK-400D – 35 gallons

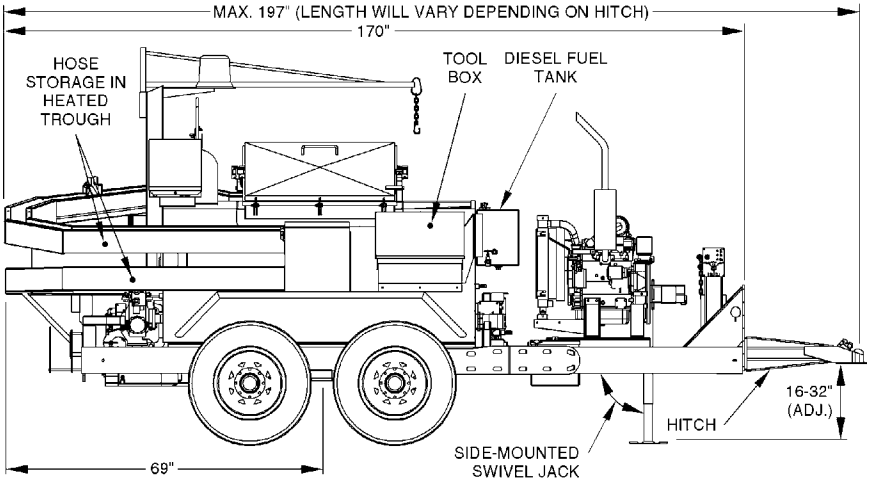
TRAILER LIGHTS AND WIRING	
Lights	Equipped with federal motor carrier safety regulation compliant stoplight, tail light, and turn signals
Warning Beacon	Located on top of the unit ON/OFF switch located on control panel
Electrical Wiring	All wiring is protected by conduit, wire loom, or other covering Berg 6-pin connector or equivalent
OVER-ALL DIMENSIONS	
Length (maximum)	197 in. (length will vary depending on hitch type)
Width	80 in.
Height	82 1/2 in. (without beacon)
Loading Height	48 in.
Hitch Height	16 in. to 32 in. (adjustable)
MISCELLANEOUS	
Tool Box	Storage for safety equipment, small tools, spare nozzle tips, and parts
Fire Extinguisher	10-lb ABC, mounted on front of unit
Thermometers	Hot-oil gauge: 150˚F to 750˚F Sealant tank gauge: 100˚F to 450˚F (Partlow temperature control) Sealant plumbing gauge: 150˚F to 750˚F
Paint	Waterborne BearCat Gold
OPTIONS	
Hitch Types	Available for a variety of ball or pintle hitches
Paint	Standard waterborne enamel colors

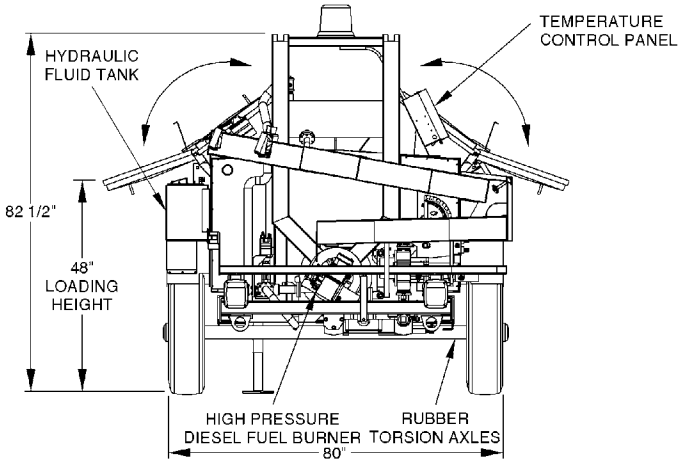
BK-250D Over-all Dimensions





BK-400 Over-all Dimensions





SAFETY PRECAUTIONS

Personal Safety

Persons responsible for the operation and maintenance of BearCat BK Series All-Diesel Krackers™ should read and understand the following safety precautions and the remainder of this manual before operating the equipment.

WARNING:	**THE MATERIALS USED IN THE Kracker ARE NORMALLY HEATED FROM 300ปF TO 450ปF DURING APPLICATION. MATERIALS USED AT THESE TEMPERATURES CAN CAUSE SERIOUS OR FATAL BURNS AND CAN BECOME EXPLOSIVE UNDER CERTAIN CONDITIONS. DIESEL FUEL USED IN THE BURNER, WHICH HEATS THESE MATERIALS, IS HIGHLY FLAMMABLE. EXTREME CARE MUST BE EXERCISED AT ALL TIMES TO ASSURE THE SAFETY OF PERSONS WORKING IN PROXIMITY TO THESE POTENTIALLY HAZARDOUS CONDITIONS.**

WARNING:	**FOLLOW THESE PRECAUTIONARY INSTRUCTIONS EXACTLY. DO NOT TAKE SHORTCUTS. DO NOT ASSUME THAT SOMEONE ELSE HAS ACTED ON YOUR BEHALF. IF ANY RULE OR PRECAUTION IS NOT CLEAR TO YOU, SEE YOUR SUPERVISOR BEFORE USING THE MACHINE.**

Safety Rules

Read each safety rule and make them a part of the daily work routine.
General Protection

WARNING:	**EXHAUST SPARKS FROM AN ENGINE CAN IGNITE VOLATILE GASES FROM THE SEALANT MATERIAL. ALWAYS KEEP A DRY CHEMICAL FIRE EXTINGUISHER FULLY CHARGED AND ON HAND AT ALL TIMES.**

Protect yourself:

- ALWAYS make sure the return and suction line gate valves at the front of the hydraulic reservoir are wired OPEN before starting the engine. A closed valve will cause the hydraulic filter to burst.
- NEVER start the engine until you have read and understand the operating manual.
- ALWAYS wear suitable insulated gloves and protective

clothing (long-sleeve shirt, long pants, and coveralls) when touching any part of the equipment.

- ALWAYS wear suitable safety glasses and a face shield.
- ALWAYS keep your body and clothing clear of rotating drive parts.

Potential Explosive/Fire Hazard Conditions

WARNING: FAILURE TO COMPLY WITH THE FOLLOWING SAFETY RULES MAY RESULT IN A FIRE OR EXPLOSION THAT COULD CAUSE SEVERE BURNS, INJURY, OR DEATH.

- NEVER allow lighted cigarettes or any burning material near open loading doors or vents.
- NEVER attempt to light the burner with any type of open flame or igniter other than the burner automatic ignition system.
- NEVER use gasoline in the burner. The burner operates on diesel fuel only.
- NEVER heat the sealant material beyond the maximum temperature recommended by the manufacturer.
- NEVER heat the sealant material in a sealant tank that leaks.
- NEVER use an open flame to heat valves or hoses.

Burner Operations

WARNING: POTENTIAL FIRE OR EXPLOSION HAZARDS EXIST WHEN OPERATING THE BURNER. FAILURE TO FOLLOW THE BURNER OPERATION SAFETY PROCEDURES COULD RESULT IN SEVERE BURNS, INJURY, OR DEATH.

- NEVER operate the burner under the following conditions:

a. While the machine is unattended.

b. While the machine is in motion.

c. When the machine is parked in a confined area.

d. If the sealant tank contains water.

- ALWAYS make sure the fire extinguisher is on the machine, fully charged (indicator in the green), and the safety seal is unbroken.
- ALWAYS make sure the heat jacket and heating coils are covered with sealant material before and during heating.
- ALWAYS allow sufficient space in the tank for the material to expand when heating.
- ALWAYS park the machine broadside to the wind, so any sealant vapors or fumes are carried away from the crew and the engine exhaust.

Sealing Operations

WARNING: WORN OR FAULTY HOSES CAN BURST AND CAUSE SEVERE BURNS OR DEATH. CHECK THE CONDITION OF ALL HOSES BEFORE OPERATING THE MACHINE.

- ALWAYS keep the application wand pointed AWAY from all personnel.
- ALWAYS check the condition of the hoses before beginning sealing operations.
- ALWAYS make sure that all pipe and hose connections are secure before opening a valve.
- ALWAYS start the product pump VERY SLOWLY, and make sure that all hoses and valves work properly.
- NEVER pump against a closed valve.
- NEVER remove the application wand from the machine without the shutoff valve in the CLOSE position.
- NEVER look into the sealant tank from the front of the machine. Hot sealant material from the tank circulation pipe and application wand is pumped forward and may splash out.
- NEVER load a block of sealant material into the sealant

tank when both loading doors are open.

Towing Procedures

Drive defensively and watch your speed. The machine contains diesel fuel and a large amount of liquid sealant at high temperature. An accident can lead to a major fire.

- NEVER tow the machine with the burner operating because you would be:

a. Breaking the law

b. Risking damage to the burner

c. Violating the first rule of burner operation (never leave the burner unattended when it is lit)

- ALWAYS make sure the wheel lug nuts and hitch bolts are tight. Check them daily.
- ALWAYS use safety chains. Connect them in a criss-cross pattern.
- ALWAYS connect the safety breakaway chain.

- ALWAYS make sure the machine is level. If not, adjust the hitch height. Towing an out of level machine can result in an accident or spilled sealant.
- ALWAYS make sure the tires are properly inflated.
- ALWAYS make sure the electrical connector for the running lights, break lights, turn signals, and electric brakes (if applicable) is connected.
- ALWAYS make sure the turn signal and break light functions match the tow vehicle inputs.

BearCat Manufacturing assumes no liability for accident or injury incurred through improper use of this equipment.

PREPARING EQUIPMENT FOR USE

WARNING:	**BEARCAT EQUIPMENT USES VOLATILE MATERIALS AT HIGH TEMPERATURES AND PRESSURES. THIS EQUIPMENT EMPLOYS HIGHLY COMBUSTIBLE OR EXPLOSIVE FUELS. POTENTIALLY LIFE-THREATENING HAZARDS MAY EXIST DURING EQUIPMENT OPERATION. ONLY QUALIFIED PERSONS SHOULD ATTEMPT TO OPERATE, SERVICE, OR MAKE ADJUSTMENTS TO THE BEARCAT EQUIPMENT.**
WARNING:	**TO AVOID POTENTIAL SEVERE BURNS, INJURY, OR DEATH, PERSONS MUST READ SECTION 2 (SAFETY PRECAUTIONS) BEFORE OPERATING BEARCAT EQUIPMENT.**
WARNING:	**OPERATORS MUST READ AND UNDERSTAND THIS MATERIAL BEFORE ATTEMPTING TO USE THE MACHINE.**
WARNING:	**ALWAYS WEAR SAFETY GEAR AND PROTECTIVE CLOTHING TO INCLUDE INSULATED GLOVES, SAFETY GLASSES AND FACE SHIELD,**
WARNING:	**LONG-SLEEVE SHIRT, LONG PANTS, BOOTS, AND COVERALLS WHEN OPERATING THE Kracker. FAILURE TO DO SO MAY RESULT IN SEVERE BURNS, INJURY, OR DEATH.**

This section contains information with which the operator must become familiar in order to prepare the BK Series All-Diesel Kracker for crack sealing operations. Four essential areas are covered:

1. Operating Controls, Gages, and Indicators

The operating functions of all Kracker controls are given. The operator must be familiar with these controls before attempting to use the equipment.

2. Initial Checkout of Machine

Preliminary inspection and control settings are given for the machine.

3. Loading Sealant Material

Initial loading and safety procedures are provided for the machine.

4. Heating/Circulating Sealant

Procedures are given, and warning and cautionary notes are emphasized

for heating and circulating sealant material to the required temperature.

Familiarity with these areas of activity will prepare the operator for safe, efficient operation of the equipment.

Operating Controls, Gages, and Indicators

Engine Control Panel

The engine control panel is mounted on a pedestal located in front of the engine on the right-hand side of the machine. It contains the ignition switch and indicators for engine glow plug preheat, water temperature, charging system, and oil pressure. The ignition switch must be in the ON position with the engine running to energize the burner circuitry.

Temperature Control Panel

The temperature control panel is located on the right-hand side of the sealant tank. The temperature control panel has a lockable cover and contains the following components:

- Burner ON/OFF switch
- Beacon switch
- Partlow temperature control
- Hour meter

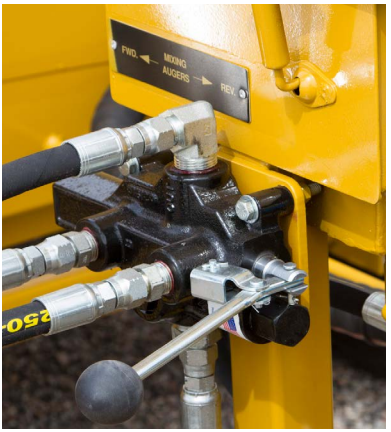
The burner ON/OFF switch starts the burner ignition sequence. The burner ignition system has a built-in, one-minute delay, which allows the electrically heated injection nozzle to preheat the diesel fuel prior to ignition. The preheat sequence eliminates burner backfires.

The beacon switch controls the amber safety beacon on top of the machine.

The Partlow temperature control is used to set sealant material temperature. The upper indicator on the control is set to the desired sealant material pour temperature (set point) by rotating the knob on the face of the control. The pour temperature is usually determined by the sealant manufacturer's specification. The lower indicator shows actual sealant material temperature within the sealant tank (pot temperature).

The hour meter records actual engine run time in hours. The hour meter enables accurate tracking of run time for scheduled maintenance such as engine oil changes.

Directional Control Valves



The directional control valves provide bi-directional, variable-speed control of the auger and product pump motors. Each valve has a center detent or NEUTRAL position. Moving the handle in either the indicated FORWARD or REVERSE direction provides proportional speed control of the hydraulic motor(s).

Hot-Oil Bypass Valve

The hot-oil bypass valve controls hydraulic fluid flow to the hot-oil pump hydraulic motor. Kracker startup and shutdown procedures are performed with the hot-oil bypass valve in the STOP (open) position.

When the hot-oil bypass valve is open, hydraulic fluid is bypassed to the hydraulic manifold assembly and the hot-oil pump does not operate. As the valve is moved to the RUN (close) position, hydraulic fluid is directed to the hot-oil pump hydraulic motor. The valve is not moved to the full RUN position until the hot-oil operating temperature increases enough to decrease the hot-oil viscosity (approximately 250˚F)

Temperature Gages

The Kracker has two temperature gages located at the rear of the machine. The left-hand gauge measures the hot-oil temperature and the right-hand gauge measures the sealant temperature in the system plumbing at the application/recirculation valve.

Initial Checkout of Machine

CAUTION: THE INITIAL CHECKOUT PROCEDURES GIVEN BELOW ARE MINIMUM REQUIREMENTS. FAILURE TO PERFORM THESE STEPS CAN RESULT IN DAMAGE TO THE EQUIPMENT AND UNSAFE OPERATING CONDITIONS.

Each day before loading the machine with sealant material, perform the following steps.

d. Visually inspect the fire extinguisher, tires, lug nuts, hitch bolts, hoses, fittings, and engine belts.

e. Make sure the battery is clean, secure, and has sufficient water in the cells.

f. Make sure the fuel feed valve for the burner is OPEN and the flush fuel valve is CLOSED.

NOTE: No. 2 grade diesel fuel will start to gel at temperatures below 50˚F. If the Kracker is operated at temperatures below 50˚F, use No. 1 grade diesel fuel. If No. 1 diesel fuel is not available, mix 80% JET-A fuel with 20%

No. 2 diesel fuel. JET-A fuel is available at most airports.

g. Make sure all fluid levels are adequate. Add fluid if necessary.

- Engine oil – the dipstick is located on the left side of the engine.
- Radiator coolant – check the coolant level in the radiator overflow tank.
- Diesel fuel – check the fuel level in the fuel tank.

CAUTION: USE EITHER TYPE 32 OR TYPE 46 HYDRAULIC FLUID IN THE HYDRAULIC RESERVOIR. DO NOT MIX FLUID TYPES.

- Hydraulic fluid – the sight glass is located on the forward end of the hydraulic reservoir.
- Heat-transfer oil (hot-oil) – the hot and cold level sight glasses are located on the left side of the hot-oil expansion tank.

CAUTION: THE SUCTION AND RETURN LINE GATE VALVES FOR THE HYDRAULIC RESERVOIR MUST BE OPEN AND WIRED IN THE OPEN POSITION. DO NOT START THE ENGINE WITH EITHER VALVE CLOSED. FAILURE TO DO SO WILL CAUSE THE HYDRAULIC FILTER TO BURST.

h. Make sure the gate valves on the hydraulic reservoir are fully OPEN and are wired in the OPEN position.

i. Position the IGNITION switch on the engine control panel to OFF.

j. Position the BURNER switch on the temperature control panel to OFF.

k. Make sure the hot-oil bypass valve is in the STOP (open) position.

CAUTION: THE VALVES LISTED IN STEP 9 CANNOT BE MOVED WHEN THE SEALANT MATERIAL IS FROZEN. MAKE SURE THE VALVES ARE IN THIS POSITION WHEN THE MACHINE IS SHUT DOWN.

l. Verify the following valves are positioned as indicated:

- Product tank valve – CLOSED
- Application/recirculation valve – “0” (full tank circulate)

m. Make sure the circulating auger and product pump directional control valves are in the center detent (NEUTRAL) position.

n. Make sure the tank and pump drain valve is CLOSED and the external pipe plug is installed.

Loading Sealant Material

WARNING: DO NOT LOAD SEALANT MATERIAL INTO THE SEALANT TANK WITH BOTH LOADING DOORS OPEN. HOT SEALANT MATERIAL WILL SPLASH OUT OF THE OPEN DOOR. HOT SEALANT MATERIAL CAN CAUSE SERIOUS OR FATAL BURNS.

Load the sealant material into the Kracker sealant tank as follows:

a. Open either sealant loading door until the door is fully open.

b. Place a block of sealant material on the sealant loading door and position it so the block rests against the loading shelf.

WARNING: DO NOT HOLD ONTO THE SEALANT LOADING DOOR HANDLE. LET THE DOOR FALL CLOSED TO KEEP HOT SEALANT FROM SPLASHING OUT OF THE TANK.

c. Push the sealant loading door up and allow it to close. The block of sealant material drops into the sealant tank when the door is almost closed.

d. During initial sealant tank loading, place as many blocks of sealant material as possible into the sealant tank.

e. Once the sealant material melts, add additional blocks of sealant to the sealant tank until the sealant level is 4 to 5 inches above the circulating auger heating coils.

Always keep the sealant tank full of sealant material. The sealant tank is full when the sealant material is just below the edge of the loading shelf. The melted sealant material should not wet the loading shelf.

A full sealant tank retains heat much longer than a partially loaded tank. Due to heat retention by the sealant material, a full sealant tank reheats to operating temperature the next day faster than an empty tank.

Heating/Circulating Sealant

WARNING:	**POTENTIAL FIRE OR EXPLOSION HAZARDS EXIST WHEN OPERATING THE BURNER. FAILURE TO FOLLOW THE BURNER OPERATION SAFETY PROCEDURES COULD RESULT IN SEVERE BURNS, INJURY, OR DEATH.**
WARNING:	**DO NOT HEAT MATERIAL BEYOND THE MAXIMUM TEMPERATURE RECOMMENDED BY THE SUPPLIER. EXCESSIVELY HEATED MATERIAL COULD CREATE AN EXPLOSION HAZARD, RESULTING IN SEVERE BURNS, INJURY, OR DEATH.**
WARNING:	**DO NOT LOAD SEALANT MATERIAL INTO THE SEALANT TANK WITH BOTH LOADING DOORS OPEN. HOT SEALANT MATERIAL WILL SPLASH OUT OF THE OPEN DOOR. HOT SEALANT MATERIAL CAN CAUSE SERIOUS OR FATAL BURNS.**
WARNING:	**EXTREME CARE MUST BE USED DURING CIRCULATION AND SEALING OPERATIONS TO MAKE SURE THAT SYSTEM COMPONENTS OPERATE AT THEIR RATED PRESSURES. FAILURE TO CHECK THE CONDITION OF ALL HOSES AND CONNECTIONS WHEN PUMPING COULD RESULT IN SEVERE BURNS, INJURY, OR DEATH FROM PUMPING ERRORS MADE WITH FAULTY COMPONENTS.**

f. The sealant material in the Kracker sealant tank must be heated to a partial liquid state before the sealant material can start to circulate in the sealant tank.

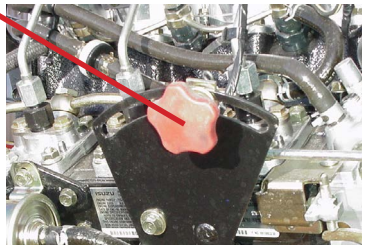
CAUTION: **THE SUCTION AND RETURN LINE GATE VALVES FOR THE HYDRAULIC RESERVOIR MUST BE OPEN AND WIRED IN THE OPEN POSITION. DO NOT START THE ENGINE WITH EITHER VALVE CLOSED. FAILURE TO DO SO WILL CAUSE THE HYDRAULIC FILTER TO BURST.**

CAUTION: **DO NOT TO START THE ENGINE UNTIL THE "INITIAL CHECKOUT OF MACHINE" PROCEDURES IN THIS SECTION ARE PERFORMED.**

Diesel Engine Startup

g. Loosen the throttle lock on the engine and let the throttle linkage float during engine start.

h. Position the IGNITION switch on the engine control panel to PREHEAT. Wait approximately 10 seconds for the glow plugs to heat.



i. Rotate the IGNITION switch to the START position and release it when the engine starts.

j. Increase the engine speed to the 3/4-throttle position for a few seconds and then reduce the engine RPM back to idle. The initial RPM increase is required to excite the engine alternator charging circuit and initiate battery charging.

k. Check the temperature, charge, and oil warning lights on the engine control panel. Make sure the warning lights go out.

l. Adjust the throttle until the engine reaches a smooth idle speed. Do not let the cold engine hammer.

m. Allow the engine to warm up for one minute. After one minute increase the engine speed to the 1/2 position on the throttle and tighten the throttle lock.

Hot-Oil Circulation

The hot-oil pressure switch requires a minimum of 4-psi system pressure to close. The burner will not ignite until the sealant heating system is pressurized by the hot-oil pump.

a. With the engine running, gradually move the hot-oil bypass valve to the RUN (close) position.

b. Make sure the hot-oil pump hydraulic motor starts to rotate.

c. Stop as soon as the engine RPM begins to drop due to the load placed on the hydraulic system by the hot-oil pump (usually 1/2 to 3/4 closed).

The hot-oil bypass valve can be moved to the full RUN position once the hot-oil reaches the minimum full circulation temperature (approximately 250˚F) as indicated on the hot-oil temperature gauge.

Burner Operation

CAUTION: BEFORE STARTING THE BURNER, POSITION THE MACHINE BROADSIDE TO THE WIND TO ALLOW THE WIND TO CARRY EMITTED VAPORS AWAY FROM THE HOT EXHAUST STACK OF THE ENGINE. FAILURE TO DO SO CREATES AN EXPLOSION HAZARD.

The diesel fuel burner is used to heat the hot-oil, which is circulated in the sealant heating system. The burner requires the following five inputs before it can light:

- Ignition switch (ON)
- Burner ON/OFF switch (ON)
- Hot-oil pressure switch (CLOSED)
- High limit switch (CLOSED)
- Partlow sealant temperature control (CLOSED)

With the ignition ON and the engine running, the hot-oil bypass valve must be closed enough for the heating system to build the minimum hot-oil system pressure. Once the hot-oil system reaches 4 psi, the pressure switch closes.

a. Make sure the burner fuel feed valve is OPEN.

b. On the temperature control panel, set the Partlow temperature control to the desired pour temperature (set point). This temperature is normally specified by the sealant material manufacturer.

c. Position the BURNER switch on the temperature control panel to ON. The burner has a one-minute preheat delay before it ignites. Wait one FULL minute for burner ignition.

NOTE: NOTE: When the hot-oil temperature reaches approximately 250˚F, move the hot-oil bypass valve to the full RUN position.

d. The burner runs until the hot-oil temperature high limit switch opens, or the Partlow sealant temperature control switch opens.

e. Position the BEACON switch on the temperature control panel to ON.

f. During the initial heating cycle the burner runs continuously for approximately 20 minutes. Once the hot-oil reaches operating temperature the burner cycles on and off about every 1 1/2 to 2 1/2 minutes depending on the hot-oil and sealant temperature differences. Each time the burner ignition sequence is initiated, the

g. one-minute burner preheat delay is started before the burner can ignite.

a. Allow the heating system to operate for approximately 30 minutes and attempt to OPEN the product tank valve. The product tank valve should move with reasonable hand pressure. If necessary, wait several minutes for the sealant to melt and try to open the valve again.

CAUTION: DO NOT FORCE THE PRODUCT TANK VALVE OPEN. WAIT UNTIL THE SEALANT MATERIAL IN THE VALVE MELTS. FORCING THE VALVE OPEN MAY DAMAGE THE EQUIPMENT AND CREATE AN UNSAFE CONDITION.

b. Position the product tank valve to the OPEN position.

c. Gradually move the product pump directional control valve handle to the FORWARD position. If the product pump squeals, stop immediately. If necessary, let the sealant continue to heat for several minutes and try to move the product pump directional control valve handle to the FORWARD position again.

d. Allow the machine to heat and circulate the sealant material.

NOTE: The circulation temperature gauge indicates approximately 300˚F due to the heating system heat trace in the plumbing. Actual product circulation does not begin until the gauge indicates an increase in temperature above 300˚F.

e. When the sealant material reaches the pour temperature (determined by the sealant manufacturer) as indicated on the circulation temperature gauge, OPEN the right-hand sealant loading door.

WARNING: NEVER LOOK INTO THE SEALANT TANK FROM THE FRONT OF THE MACHINE. SEALANT CIRCULATING FROM THE CIRCULATION PIPE OR THE APPLICATION WAND IS PUMPED FORWARD. HOT SEALANT MAY SPLASH FORWARD, RESULTING IN SEVERE BURNS OR INJURY.

f. Looking from the rear of the sealant tank, verify there is adequate sealant flow from the circulation pipe into the sealant tank.

g. Close the right-hand sealant loading door.

NOTE: It is not necessary for the entire sealant tank to be liquefied to begin work. Crack sealing operations may begin as soon as there is adequate flow through the application wand. The sealant material is normally ready for application in about one hour.

h. With the application wand positioned in the hose trough, OPEN the application wand shutoff valve.

i. Gradually move the application/recirculation valve from the “0” position to the “8” position.

j. If the product pump begins to squeal, immediately move the product pump directional control valve to the REVERSE position and immediately back to the FORWARD position. If necessary, wait several minutes for the sealant to melt and attempt to circulate sealant through the application wand again.

k. OPEN the left-hand sealant loading door.

WARNING: NEVER LOOK INTO THE SEALANT TANK FROM THE FRONT OF THE MACHINE. SEALANT CIRCULATING FROM THE CIRCULATION PIPE OR THE APPLICATION WAND IS PUMPED FORWARD. HOT SEALANT MAY SPLASH FORWARD, RESULTING IN SEVERE BURNS OR INJURY.

l. Looking from the rear of the sealant tank, verify there is adequate sealant flow from the application wand nozzle into the sealant tank. If necessary, wait until the sealant flow from the application wand increases.

m. Remove the external cap from the application wand return tube.

n. Position the product pump directional control valve to full REVERSE.

o. CLOSE the application wand shutoff valve and lift the application wand from the hose trough. Keep the application wand from falling off the hose trough and remove the entire application wand hose from the hose trough.

p. Stretch out the application wand hose and attach the hose to the hose boom.

q. Place the application wand in the application wand return tube and retaining bracket assembly.

r. OPEN the application wand shutoff valve.

s. CLOSE the left-hand sealant loading door.

t. Position the product pump directional control valve to full FORWARD.

u. Allow the sealant material to circulate through the application wand.

v. Crack sealing operations can begin. Continue to add blocks of sealant material to the sealant tank. Always keep the sealant tank full. As work continues, the remainder of the sealant material will liquefy.

CAUTION: **IF THE CIRCULATING AUGERS MAKE A SQUEALING SOUND WHEN THE DIRECTIONAL CONTROL VALVE HANDLE IS MOVED, IMMEDIATELY STOP THE AUGERS. ALLOW ADDITIONAL TIME FOR THE SEALANT TO HEAT AND ATTEMPT TO RESTART THE CIRCULATING AUGERS. FAILURE TO DO SO MAY DAMAGE THE HYDRAULIC SYSTEM.**

w. When the sealant material temperature reaches the pour temperature as indicated on the Partlow temperature control, gradually move the circulating auger directional control valve to the FORWARD or REVERSE position.

x. Operate the circulating augers for the remainder of the crack sealing operation.

WARNING:	**BEARCAT EQUIPMENT USES VOLATILE MATERIALS AT HIGH TEMPERATURES AND PRESSURES. THIS EQUIPMENT EMPLOYS HIGHLY COMBUSTIBLE OR EXPLOSIVE FUELS. POTENTIALLY LIFE-THREATENING HAZARDS MAY EXIST DURING EQUIPMENT OPERATION. ONLY QUALIFIED PERSONS SHOULD ATTEMPT TO OPERATE, SERVICE, OR MAKE ADJUSTMENTS TO THE BEARCAT EQUIPMENT.**
WARNING:	**EXTREME CARE MUST BE USED DURING CIRCULATION AND SEALING OPERATIONS TO MAKE SURE THAT SYSTEM COMPONENTS OPERATE AT THEIR RATED PRESSURES. FAILURE TO CHECK THE CONDITION OF ALL HOSES AND CONNECTIONS WHEN PUMPING COULD RESULT IN SEVERE BURNS, INJURY, OR DEATH FROM PUMPING ERRORS MADE WITH FAULTY COMPONENTS.**
WARNING:	**TO AVOID POTENTIAL SEVERE BURNS, INJURY, OR DEATH, PERSONS MUST READ SECTION 2 (SAFETY PRECAUTIONS) BEFORE OPERATING BEARCAT EQUIPMENT.**
WARNING:	**ALWAYS WEAR SAFETY GEAR AND PROTECTIVE CLOTHING TO INCLUDE INSULATED GLOVES, SAFETY GLASSES AND FACE SHIELD,**
WARNING:	**LONG-SLEEVE SHIRT, LONG PANTS, BOOTS, AND COVERALLS WHEN OPERATING THE Kracker. FAILURE TO DO SO MAY RESULT IN SEVERE BURNS, INJURY, OR DEATH.**

Ensure the necessary procedures in the PREPARATION section are accomplished before performing any of the operations described in this section.

Sealant Application

Crack sealing operations may begin as soon as there is adequate flow through the application wand as described in PREPARING EQUIPMENT FOR USE SECTION.

WARNING: ALWAYS KEEP THE APPLICATION WAND POINTED AWAY FROM ALL PERSONNEL. FAILURE TO DO SO COULD RESULT IN SEVERE BURNS, INJURY, OR DEATH.

25. CLOSE the application wand shutoff valve.

26. Remove the application wand from the application wand return tube.

27. Place the application wand tip in the selected crack and OPEN the application wand shutoff valve. Move the application wand along the crack.

28. CLOSE the application wand shutoff valve at the end of the crack. Keep the application wand shutoff valve in the CLOSE position when moving from one crack to the next.

29. Use the application/recirculation valve to adjust the flow rate of the sealant material through the application wand (normally the “7” or “8” position).

30. Place the application wand in the application wand return tube and OPEN the shutoff valve when the application wand is not in use.

31. Keep the sealant material tank full during crack sealing operations. Add sealant material in accordance with the procedures given in PREPARING EQUIPMENT FOR USE SECTION, Loading Sealant Material.

Shutdown

At the end of crack sealing operations, make sure the sealant tank is full. If necessary, add sealant material in accordance with the procedures given in SECTION 3. PREPARING EQUIPMENT FOR USE, Loading Sealant Material, prior to shutdown.

The BK Series All-Diesel Kracker is designed with a Flush-Free™ system to eliminate solvent flushing at the end of the work shift.

CAUTION: DO NOT SHORT CUT THE FOLLOWING PROCEDURES. FAILURE TO FOLLOW THESE PROCEDURES EXACTLY WILL RESULT IN BLOCKED PLUMBING AND EXTENDED HEATING TIMES.

The shutdown procedures given below assume the machine is at normal operating temperature, the product pump is in FORWARD, and sealant material is circulating through the application wand and hose.

1. Place the application wand in the application wand return tube and retaining bracket assembly, and OPEN the application wand shutoff valve.

2. Loosen the throttle lock on the engine and increase the engine speed to FULL throttle. Tighten the throttle lock.

3. Move the application/recirculation valve to the “9” position. A slight squealing may be heard from the product pump hydraulic motor.

4. Allow the machine to circulate sealant through the application wand and hose for approximately three minutes.

5. Position the product pump directional control valve to full REVERSE.

6. Move the application/recirculation valve from the “9” position to the “0” position for 30 seconds.

7. Move the application/recirculation valve from the “0” position to the “10” position.

8. CLOSE the application wand shutoff valve and remove the application wand from the application wand return tube and retaining bracket assembly.

9. Remove the application wand hose from the hose boom and lay the hose out straight on the ground.

WARNING: ALWAYS KEEP THE APPLICATION WAND POINTED AWAY FROM ALL PERSONNEL. FAILURE TO DO SO COULD RESULT IN SEVERE BURNS, INJURY, OR DEATH.

10. Raise the application wand overhead. With the nozzle pointing up, cycle the shutoff valve OPEN and CLOSED 10 to 12 times. An audible sucking sound should be heard from the nozzle when the hose starts to clear.

11. With the shutoff valve OPEN and the wand raised, have a helper raise the hose and slowly walk the hose toward the machine to let the hose drain sealant down into the machine.

12. CLOSE the application wand shutoff valve and place the application wand in the application wand return tube and retaining bracket assembly.

13. OPEN the left-hand sealant loading door.

14. Remove the application wand from the application wand return tube and place the application wand in the hose trough.

15. CLOSE the left-hand sealant loading door.

16. Install the external cap on the application wand return tube.

17. Place the application wand hose into the hose trough. Close the hose trough door and make sure the flexible hose trough cover is pulled over the top of the hose.

18. Position the BURNER switch on the temperature control panel to OFF.

19. Position the circulating auger directional control valve to the NEUTRAL (center) position.

20. Position the hot-oil bypass valve to the STOP (open) position.

CAUTION: THE VALVES LISTED IN STEP 21 AND STEP 22 CANNOT BE MOVED WHEN THE SEALANT MATERIAL IS FROZEN. MAKE SURE THE VALVES ARE IN THIS POSITION WHEN THE MACHINE IS SHUTDOWN.

21. Position the application/recirculation valve to the “0” position.

22. Position the product tank valve to the CLOSE position.

23. Position the product pump directional control valve to the NEUTRAL (center) position.

24. Loosen the throttle lock on the engine and reduce the engine speed to a smooth idle. Allow the engine to run at idle speed for a one-minute cool down prior to shutdown.

25. Position the BEACON switch on the temperature control panel to OFF.

26. Position the IGNITION switch on the engine control panel to OFF.

Preparation for Overnight Shutdown

Before the present work shift ends, add sealant material to the sealant tank until the tank is full (4 to 5 inches above the heating coils). Close and latch the sealant loading doors and make sure the external cap is installed on the application wand return tube.

A full load of sealant retains heat longer than a partial load. Startup

time at the beginning of the next work shift is minimized when the sealant tank is kept full.

Preparation Following Extended Shutdown

If the Kracker is shutdown for two or more days, the following preparation will allow normal startup for the next work shift.

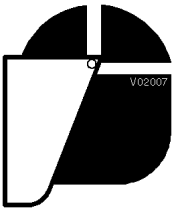
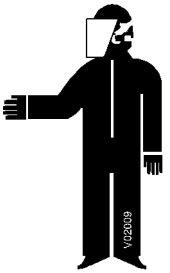
On the day before the normal work shift, start the hot-oil pump and the burner in accordance with the procedures given in PREPARING EQUIPMENT FOR USE SECTION. DO NOT run the circulating augers or the product pump.

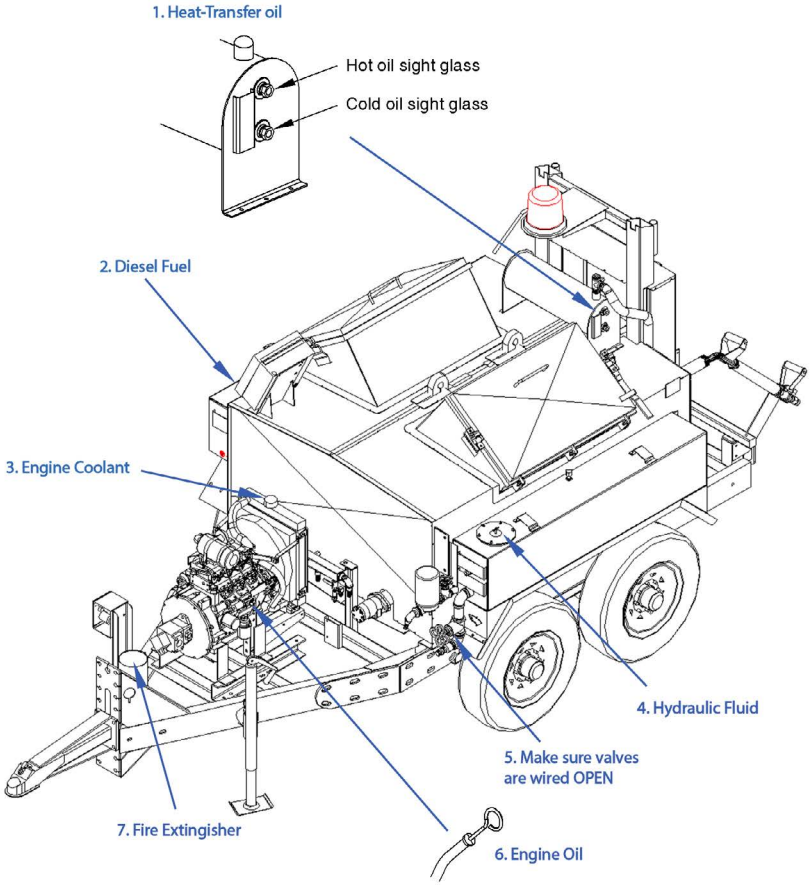
After one hour, shut off the burner and the hot-oil pump and shut down the machine. The heat will diffuse through the sealant material overnight and normal startup procedures may be used the next day.

Quick Reference Operating Guide

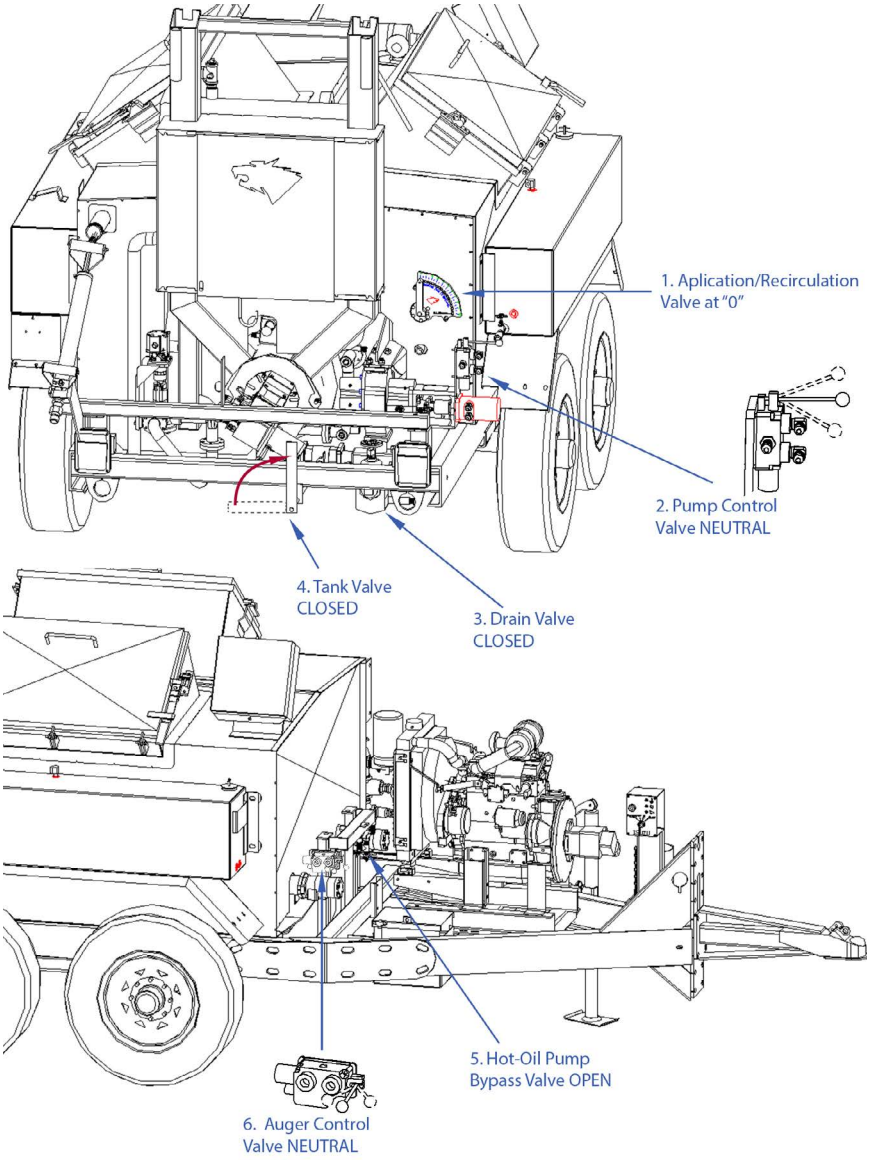
The following illustrated operating guide is provided as an aid to Kracker operation. The illustrated guide is meant to supplement the setup and operating instructions provided in this manual, not replace them. The operator must be trained and familiar with all safety and operating information given in this manual prior to performing any crack sealing operations.

A separate copy of this quick reference operating guide is provided for use on the machine. Replacement copies of the operating guide are available from BearCat.

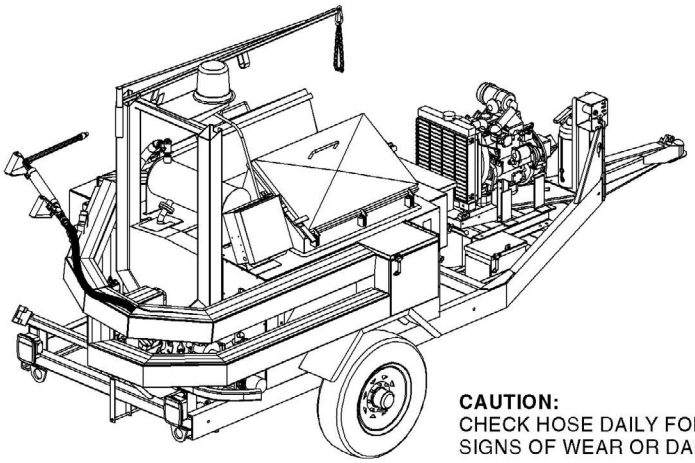
Wear Safety Glasses and Face Shield	
Wear Insulated Gloves	HOT
Wear Protective Clothing (long-sleeve shirt, pants, boots, and coveralls)	
Avoid Fire or Flame Near Machine	


1. Heat-Transfer oil
Hot oil sight glass
Cold oil sight glass
2. Diesel Fuel
3. Engine Coolant
4. Hydraulic Fluid
5. Make sure valves are wired OPEN
6. Engine Oil
7. Fire Extingisher

BEFORE STARTING ENGINE, CHECK VALVES

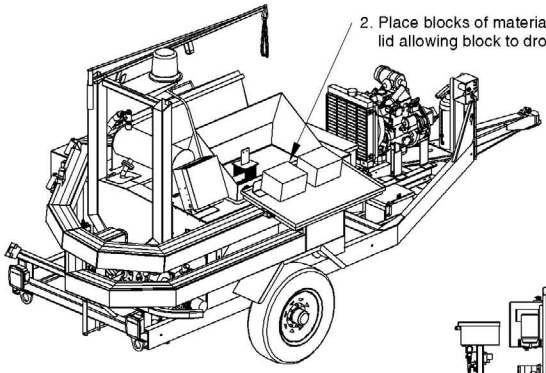

1. Aplication/Recirculation Valve at "0"
2. Pump Control Valve NEUTRAL
4. Tank Valve CLOSED
3. Drain Valve CLOSED
5. Hot-Oil Pump Bypass Valve OPEN
6. Auger Control Valve NEUTRAL

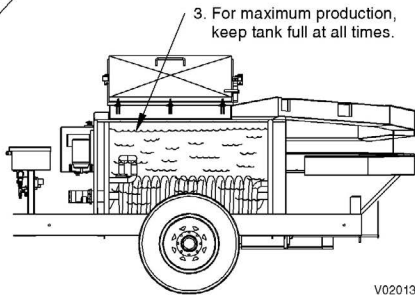
1. For best results ALWAYS place application hose in hose trough whenever stored or transported.



CAUTION:
CHECK HOSE DAILY FOR SIGNS OF WEAR OR DAMAGE.

WARNING: DO NOT LOAD SEALANT MATERIAL INTO THE SEALANT TANK WITH BOTH LOADING DOORS OPEN. HOT SEALANT MATERIAL WILL SPLASH OUT OF THE OPEN DOOR. HOT SEALANT MATERIAL CAN CAUSE SERIOUS OR FATAL BURNS.

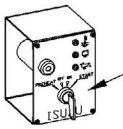




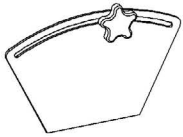
CAUTION:
DO NOT SET BLOCKS OF MATERIAL DIRECTLY ON GROUND. ROCKS AND DIRT WILL STICK TO THE BLOCKS.

V02013

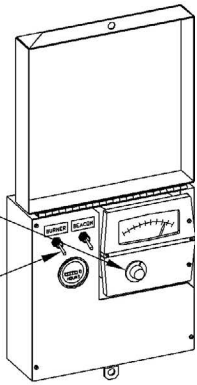
WARNING: POTENTIAL FIRE OR EXPLOSION HAZARDS EXIST WHEN OPERATING THE BURNER. DO NOT OPERATE THE BURNER WHEN THE MACHINE IS TOWED OR IS UNATTENDED. FAILURE TO FOLLOW THE BURNER OPERATION SAFETY PROCEDURES COULD RESULT IN SEVERE BURNS, INJURY, OR DEATH.



1. Hold key in preheat position, count 10 seconds. Coil will glow, start engine.



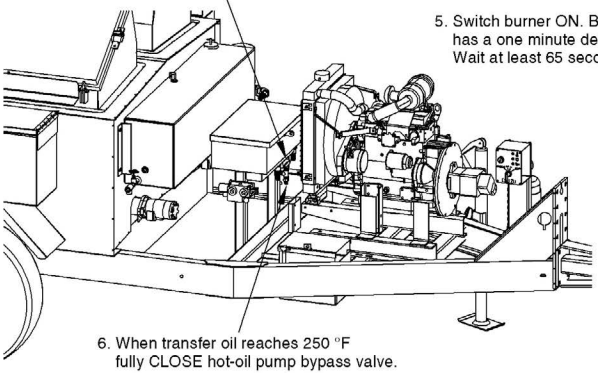
2. Move throttle control to 3/4 speed to excite alternator then back off to 1/4 to 1/2 speed for most work. Allow engine to warm up for approximately one minute.



4. Set desired temperature.

5. Switch burner ON. Burner has a one minute delay. Wait at least 65 seconds.

3. Partially CLOSE hot-oil pump bypass valve until engine bogs slightly.

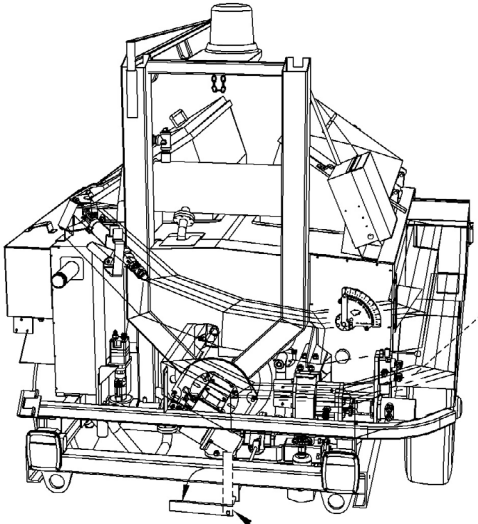


6. When transfer oil reaches 250 °F fully CLOSE hot-oil pump bypass valve.

V02014

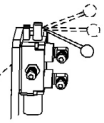
WARNING: NEVER LOOK INTO THE SEALANT TANK FROM THE FRONT OF THE MACHINE. SEALANT CIRCULATING FROM THE CIRCULATION PIPE OR THE APPLICATION WAND IS PUMPED FORWARD. HOT SEALANT MAY SPLASH FORWARD, RESULTING IN SEVERE BURNS OR INJURY.

1.Wait for burner to cycle off for the first time (20-30 minutes heating and 525° F on hot-oil temperature gauge.)



4. Carefully open the right-hand sealant loading door. Verify material flow from circulation pipe. Close sealant loading door.

5. Make sure application/recirculation valve is set at "0" for full circulation.



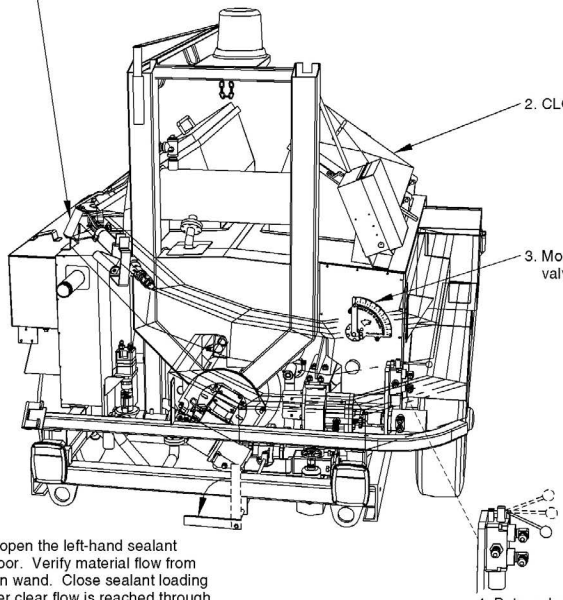
3. Put pump in FORWARD, if a squealing noise is heard or the engine bogs down, put the pump in NEUTRAL and allow machine to heat longer.

2. After 30 minutes try to OPEN the tank valve. The valve should open easily, if it does not, allow machine to heat longer - DO NOT FORCE.

RECIRCULATING MATERIAL THRU HOSE AND WAND

WARNING: ALWAYS REVERSE THE PRODUCT PUMP AND CLOSE THE APPLICATION WAND VALVE BEFORE REMOVING THE HOSE ASSEMBLY FROM THE HOSE TROUGH OR RETURNING THE HOSE ASSEMBLY TO THE HOSE TROUGH.

1. Make sure application hose and wand assembly are in hose trough and application wand is in locked position. OPEN wand valve.



2. CLOSE sealant loading door.

3. Move application/recirculation valve from "0" to "8".

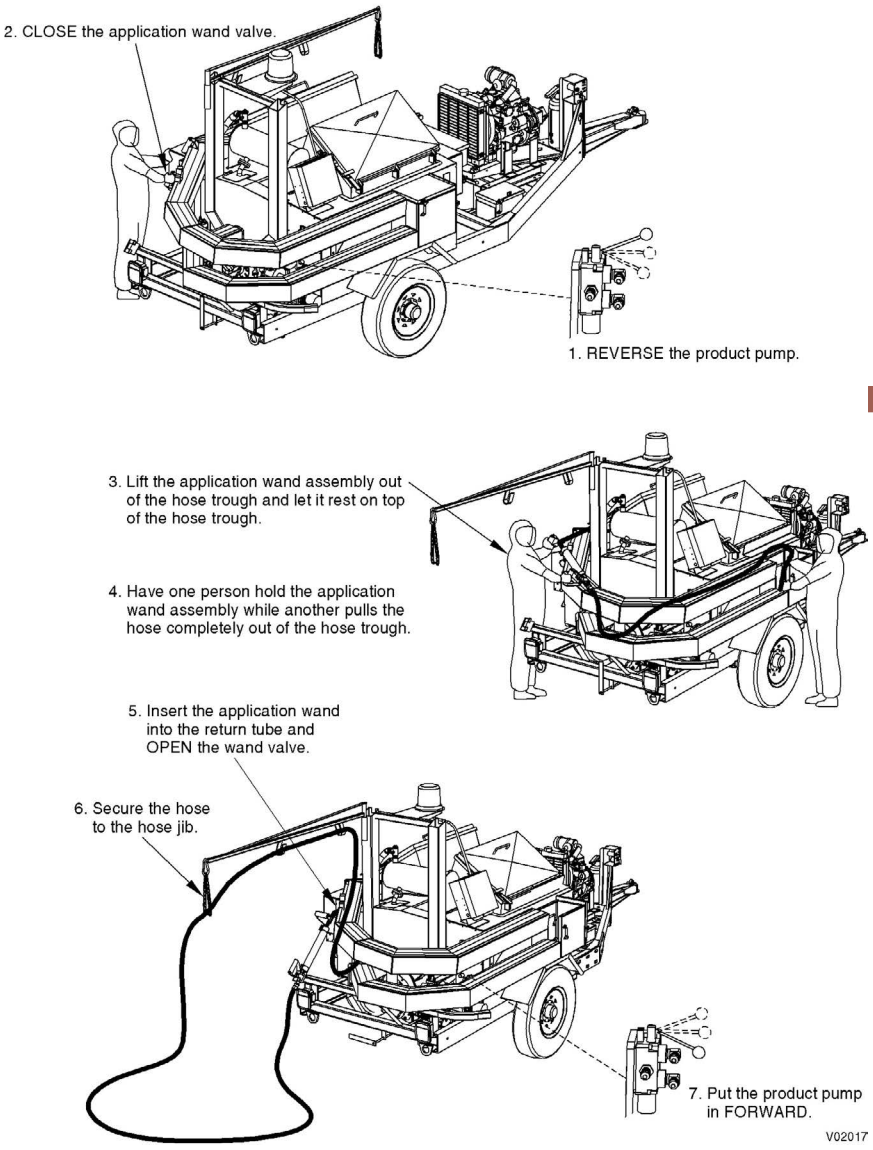
4. Put product pump in FORWARD.

5. Carefully open the left-hand sealant loading door. Verify material flow from application wand. Close sealant loading door. After clear flow is reached through hose, move application/recirculation valve to desired application setting.

WARNING: NEVER LOOK INTO THE SEALANT TANK FROM THE FRONT OF THE MACHINE. SEALANT CIRCULATING FROM THE CIRCULATION PIPE OR THE APPLICATION WAND IS PUMPED FORWARD. HOT SEALANT MAY SPLASH FORWARD, RESULTING IN SEVERE BURNS OR INJURY.

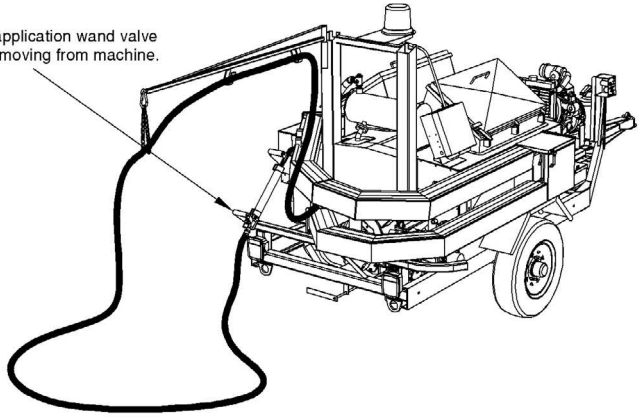
V02016

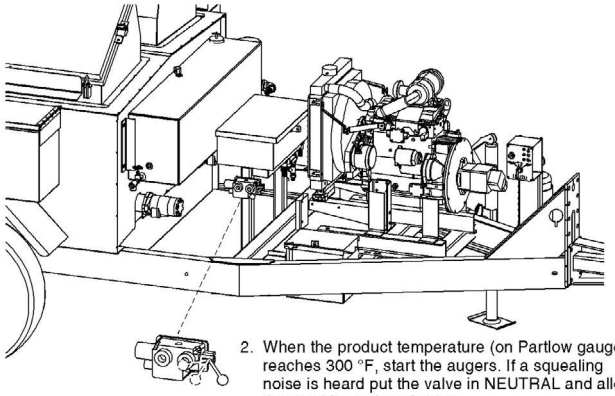
REMOVING THE HOSE FROM THE TROUGH


2. CLOSE the application wand valve.
1. REVERSE the product pump.
3. Lift the application wand assembly out of the hose trough and let it rest on top of the hose trough.
4. Have one person hold the application wand assembly while another pulls the hose completely out of the hose trough.
5. Insert the application wand into the return tube and OPEN the wand valve.
6. Secure the hose to the hose jib.
7. Put the product pump in FORWARD.
V02017

WARNING: THE MATERIALS USED IN THE BK SERIES KRACKER™ ARE NORMALLY HEATED FROM 300 °F TO 450 °F DURING APPLICATION. MATERIALS USED AT THESE TEMPERATURES CAN CAUSE SERIOUS OR FATAL BURNS AND CAN BECOME EXPLOSIVE UNDER CERTAIN CONDITIONS.

1. CLOSE application wand valve before removing from machine.

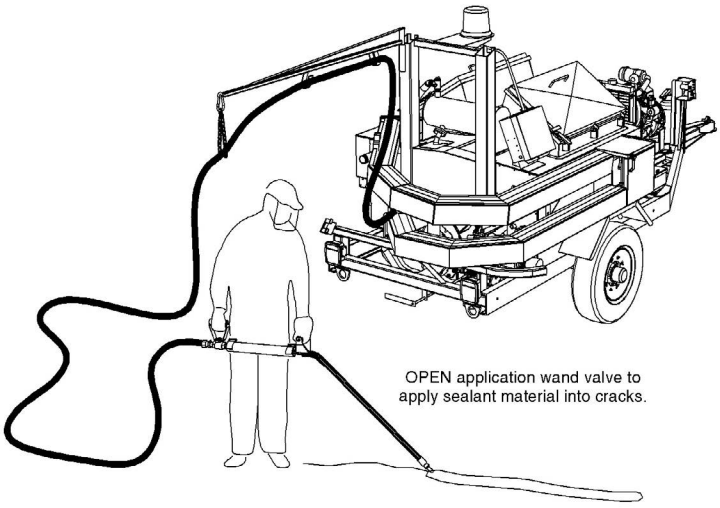




2. When the product temperature (on Partlow gauge) reaches 300 °F, start the augers. If a squealing noise is heard put the valve in NEUTRAL and allow the machine to heat longer.

V02018

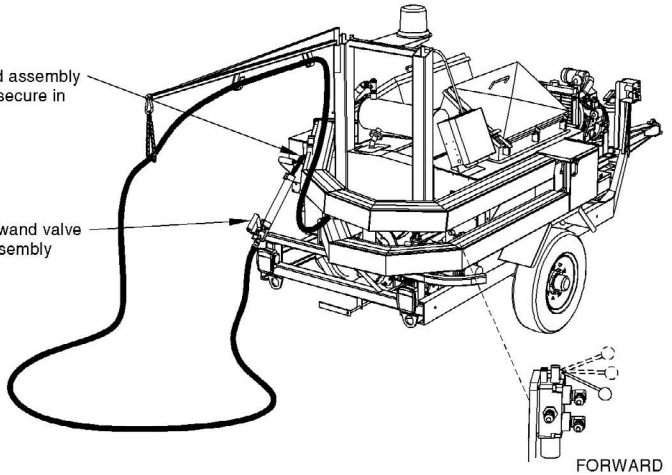
WARNING: ALWAYS KEEP THE APPLICATION WAND POINTED AWAY FROM ALL PERSONNEL. FAILURE TO DO SO COULD RESULT IN SEVERE BURNS, INJURY, OR DEATH.

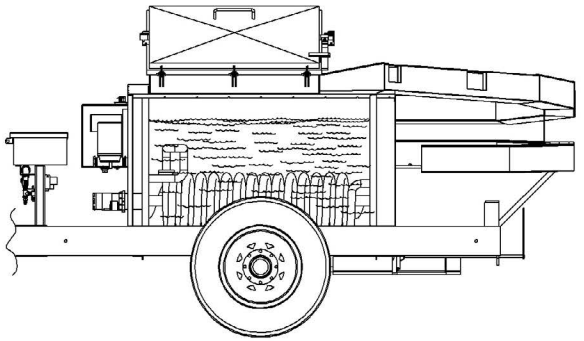

OPEN application wand valve to apply sealant material into cracks.
CLOSE application wand valve at the end of each crack.
V02019

CAUTION: HOSE AND WAND ASSEMBLY MUST CIRCULATE TO TANK WHEN NOT FILLING CRACKS! FAILURE TO CIRCULATE APPLICATION WAND ASSEMBLY WILL CAUSE CLOGS IN HOSE AND WAND.

1. Place application wand assembly in the return tube and secure in assembly bracket.

2. OPEN the application wand valve and allow the wand assembly to circulate.

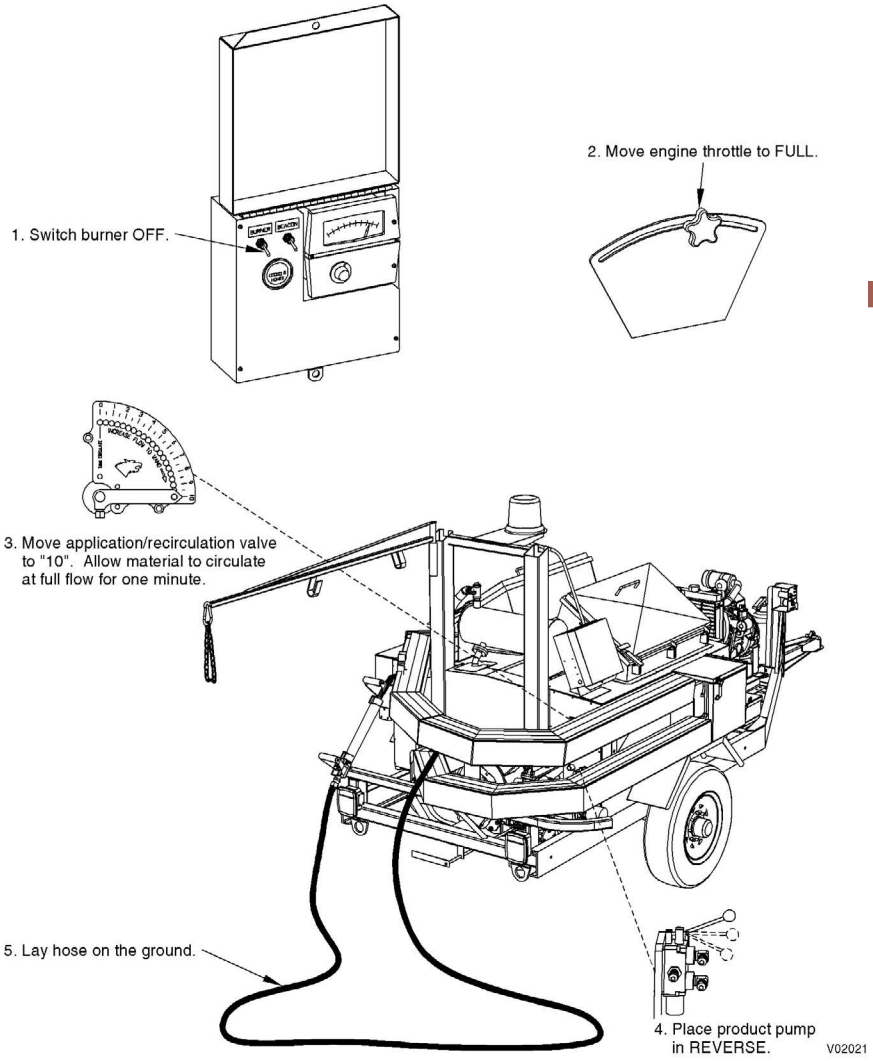




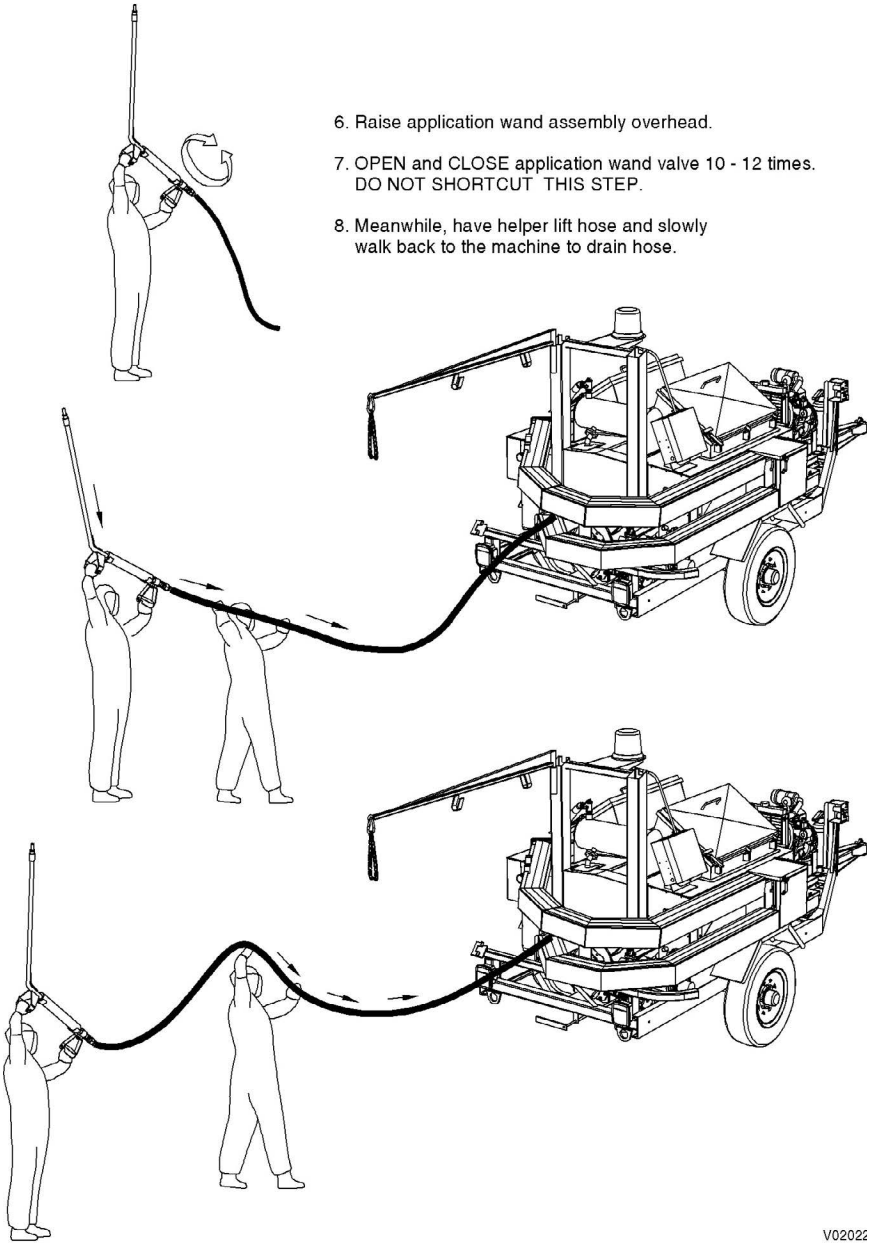
NOTE:
For maximum heat recovery, keep the tank FULL.

V02020

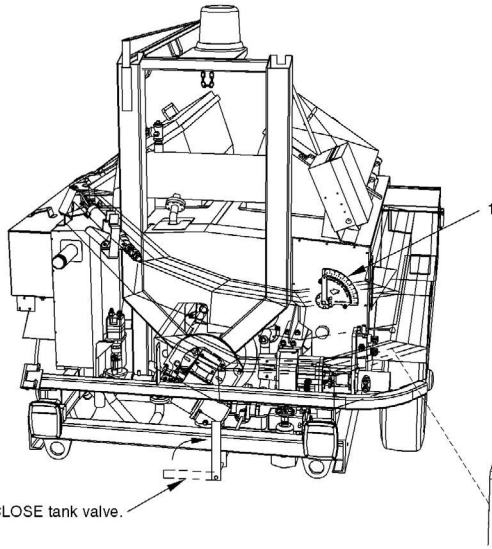
WARNING: ALWAYS REVERSE THE PRODUCT PUMP AND CLOSE THE APPLICATION WAND VALVE BEFORE REMOVING THE HOSE ASSEMBLY FROM THE HOSE RETURN TUBE AND BRACKET OR RETURNING THE HOSE ASSEMBLY TO THE HOSE RETURN TUBE AND BRACKET.


1. Switch burner OFF.
2. Move engine throttle to FULL.
3. Move application/recirculation valve to "10". Allow material to circulate at full flow for one minute.
4. Place product pump in REVERSE.
5. Lay hose on the ground.
V02021

CLEAN OUT PROCEDURE (cont)


6. Raise application wand assembly overhead.
7. OPEN and CLOSE application wand valve 10 - 12 times.
DO NOT SHORTCUT THIS STEP.
8. Meanwhile, have helper lift hose and slowly
walk back to the machine to drain hose.
V02022

WARNING: ALWAYS REVERSE THE PRODUCT PUMP AND CLOSE THE APPLICATION WAND VALVE BEFORE REMOVING THE HOSE ASSEMBLY FROM THE HOSE THROUGH OR RETURNING THE HOSE ASSEMBLY TO THE HOSE TROUGH.

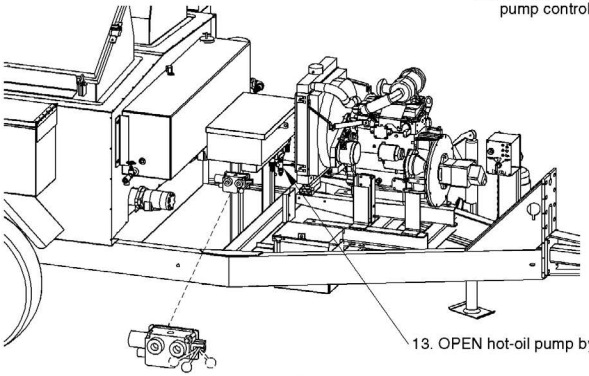


9. CLOSE the application wand valve and return the hand wand to the hose trough. Put the hose assembly in the hose trough and make sure the hose is under the trough cover.

10. Move the application/recirculation valve to "0" (wait one minute before proceeding).

11. CLOSE tank valve.

12. Quickly move the product pump control valve to NEUTRAL.



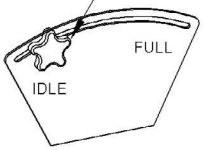
13. OPEN hot-oil pump bypass valve.

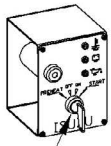
14. Turn augers off - NEUTRAL.

V02023

CLEAN OUT PROCEDURE (cont)

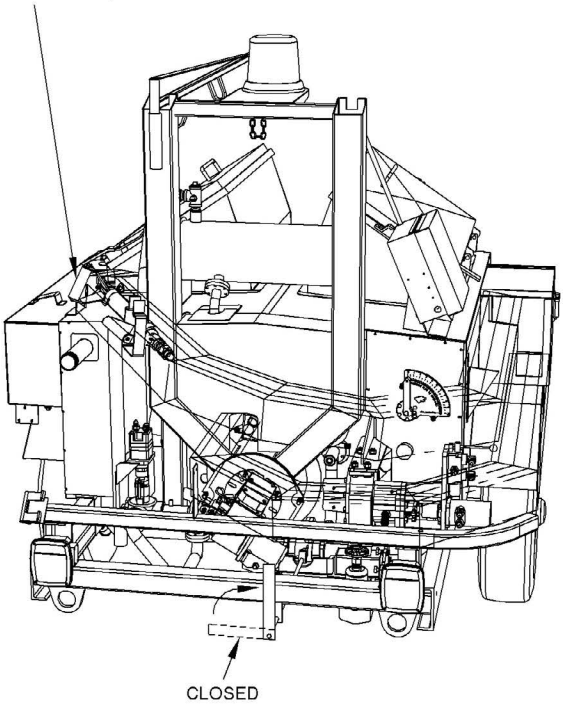
15. Throttle at IDLE for one minute to allow engine to cool.





16. Turn key OFF.

17. Store hose and wand on machine in hose trough. Leave wand valve in the OPEN position to lock wand.



CAUTION: MAKE SURE ALL VALVES ARE IN THE CORRECT STARTUP POSTION BEFORE THE MACHINE COOLS DOWN.

- APPLICATION/RECIRCULATION VALVE "0"
- TANK VALVE CLOSED
- WAND VALVE OPEN

V02024

FIELD MAINTENANCE

The recommended field maintenance procedures and scheduled intervals for the care of the BK Series All-Diesel Crack Sealing machines are listed in this section. Overall productivity of the Kracker is increased and equipment downtime is minimized by carefully following the procedures given in this section. In addition, the individual component manufacturers' literature included in the back of this manual should be followed.

Perform all diesel engine checks, oil and filter changes, and other maintenance procedures as recommended by the engine manufacturer.

Replace the hydraulic system filter element every 500 hours of machine operation as indicated by the hour meter on the temperature control panel.

Hydraulic System Filter

Scheduled Maintenance

Table 5-1 lists Kracker maintenance and inspection items and the necessary intervals when they are to be performed.

Table 5-1. Scheduled Maintenance

PERIOD	MAINTENANCE AND INSPECTION ITEM
Daily	1..... Check trailer lights and connectors 2..... Check for leaks at hose connections, valves, and tank fittings 3..... Check tire pressure 4..... Make sure hitch bolts and lug nuts are secure 5..... Make sure safety chains are secure 6..... Make sure the safety break-away chain is attached 7..... Check hydraulic fluid level (Note 1) 8..... Check hot-oil fluid level (Note 2)
Weekly	1..... Inspect product pump bearings for leaks 2.....Check brake fluid level in hitch master cylinder (if applicable) 3.....Check battery water level and connections
6 Months	1..... Pack product pump bearings (Note 3) 2..... Pack wheel bearings 3..... Inspect brake linings 4..... Replace fuel filter or service sediment bowl
12 Months	1..... Sample hot-oil and test, or drain and replace (Note 3) 2..... Replace hydraulic system filter 3.....Replace hydraulic system fluid
500 Hours	1..... Replace hydraulic system filter 2..... Replace fuel filter or service sediment bowl
1000 Hours	1..... Sample hot-oil and test, or drain and replace (Note 3) 2.....Replace hydraulic system fluid

1. Check the hydraulic fluid level with the sight glass located on the front of the hydraulic reservoir. Fluid should be visible when the system is cold.

2. Check the hot-oil level with the sight glass located on the left side of the hot-oil expansion tank. Oil should be visible on the lower sight glass when the system is cold.

Table 5-2. Engine Maintenance Schedule

DESCRIPTION OF CHECK	DAILY	300 HRS	600 HRS	1200 HRS	REMARK
COOLING SYSTEM					
Coolant level and coolant fouling check	X				10 mm upper position from the radiator core
Coolant leak check	X				
Radiator filler cap fitting condition	X				To be securely tightened
Fan belt tension check (replace if necessary)	X				Deflection of 8-12 mm (approx 10 kg force)
Coolant temperature check	X				75 – 90 °C
Coolant replacement					Every 6 months
Radiator external face cleaning			X		
Cooling system circuit cleaning				X	
Radiator filler cap* function check		X			According to engine manufacturer's specifications
AIR INTAKE SYSTEM					
Replace air cleaner* element		X			
ELECTRICAL SYSTEM					
Electrolyte level check		X			Replenish with distilled water
Battery Cleaning		X			
Ammeter registration	X				Immediately after engine start, gauge goes to + side
Charge warning lamp	X				Light off (during operation)
Electrolyte gravity check			X		
Wiring and connection check				X	
Preheating condition check	X				About 25 seconds
ENGINE					
Engine starting conditions and noise conditions	X				
Exhaust smoke condition	X				Exhaust smoke color
Valve clearance check*				X	According to engine manufacturer's specifications

The service intervals after 1200 hours of operation should be made every 100 hours of operation in accordance with Table 5-1.

2. When service on the asterisked (*) items is necessary, consult the engine manufacturer's requirements.

Heat-Transfer Oil (Hot-Oil) Replacement

Table 5-3 lists the tools and equipment necessary to replace the hot-oil in the sealant heating system.

Table 5-3. Tools and Equipment

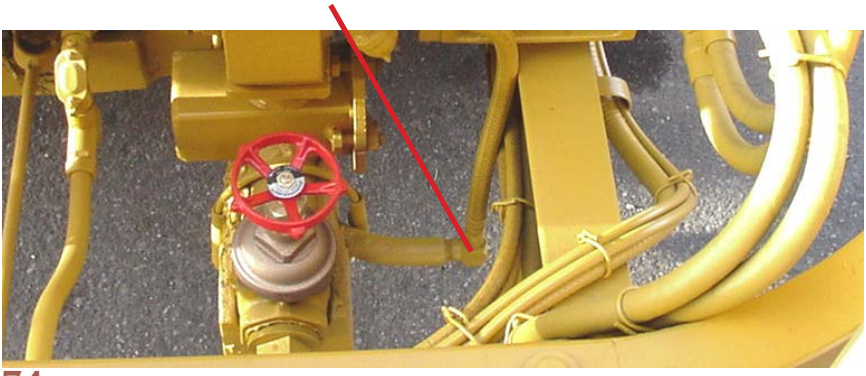
TYPE	DESCRIPTION
Air Compressor	100 CFM capacity or larger
Air Hose	Minimum 1/2 in. I.D. with Female Quick Coupler
Pipe Bushing	1-in. X 1/4-in. NPT Bushing
Air Coupling	1/4-in. Male Quick Coupler Fitting
Bucket or Drain Pan	11-gallon or larger

WARNING: ALLOW THE HOT-OIL TO COOL FOR A MINIMUM OF 24 HOURS AFTER BURNER OPERATION BEFORE DRAINING THE SEALANT HEATING SYSTEM. FAILURE TO DO SO COULD RESULT IN SEVERE BURNS, INJURY, OR DEATH.

Perform the following procedures to replace the hot-oil in the sealant heating system.

1. Place the drain pan (11-gallon minimum) below the drain valve and product pump.
2. Loosen the bottom fitting of the flex line, which connects the heat trace system to the drain valve heat jacket.

CAUTION: THE HOT-OIL DRAINS FROM THE FLEX LINE FITTING AND THE HEAT JACKET FITTING.



3. Remove the flex line from the heat jacket fitting and allow the hot-oil to drain from the sealant heating system into the drain pan.

4. Start the hot-oil pump in accordance with the procedures given in PREPARING EQUIPMENT FOR USE SECTION. DO NOT START THE BURNER.

5. Let the hot-oil pump run until the hot-oil stops flowing from the flex line fitting.

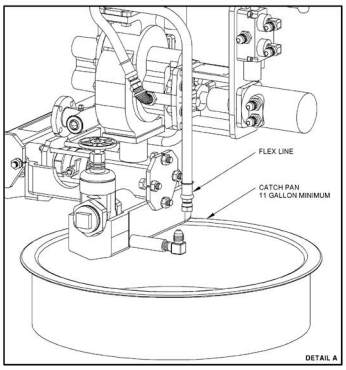
6. Shutdown the hot-oil pump and diesel engine in accordance with the procedures given in OPERATING INSTRUCTIONS SECTION.

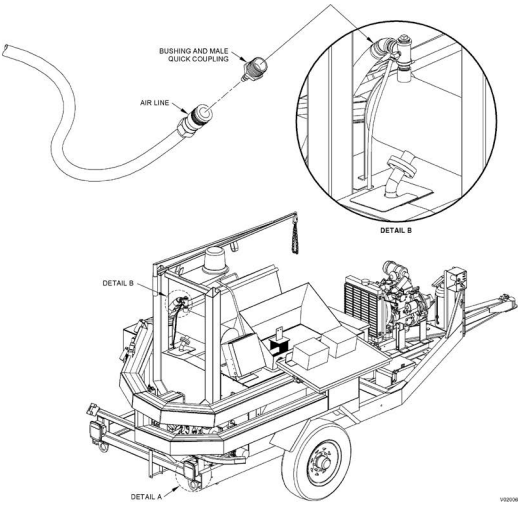
7. Remove the overflow line and straight fitting from the hot-oil expansion tank 90-degree elbow.

8. Install the pipe bushing and male quick coupling in the 90-degree elbow.

9. Attach an air hose to the quick coupling and allow air pressure to purge any remaining hot-oil from the sealant heating system.

10. Remove the air hose from the quick coupling.





A diagram of the hot-oil replacement setup for the Kracker. This portion of the procedure will effectively drain the hot-oil from the sealant heating system. To refill the system with new oil perform the following steps.

a. Remove the pipe bushing and male quick coupling from the 90-degree elbow on the hot-oil expansion tank.

b. Install the overflow line and straight fitting in the hot-oil expansion tank 90-degree elbow.

c. Install the flex line fitting on the drain valve heat jacket fitting.

d. Remove the filler cap located on the top of the hot-oil expansion tank.

e. Start the hot-oil pump. DO NOT START THE BURNER.

f. Add hot-oil until the expansion tank is full. Allow the hot-oil pump to run for 15 minutes and check the expansion tank cold level sight glass.

CAUTION: **THE HOT-OIL EXPANSION TANK SHOULD CONTAIN APPROXIMATELY A 4-INCH DEPTH OF HOT-OIL (COLD SYSTEM). DO NOT OVERFILL.**

g. Add hot-oil as necessary to maintain a visible level in the lower sight glass of the hot-oil expansion tank.

h. Shut down the hot-oil pump and diesel engine. Replace the hot-oil expansion tank filler cap.

i. Check the flex line to drain valve heat jacket fitting for leaks.

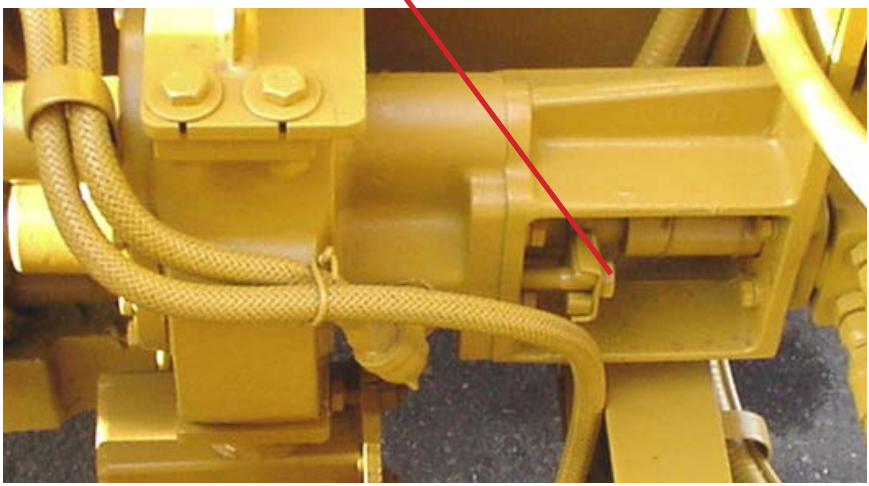
NOTE: When the burner is operated for the first time after the hot-oil replacement procedure, some hot-oil may spill from the hot-oil expansion tank overflow line.

j. Place a bucket or drain pan under the hot-oil expansion tank overflow line to catch any hot-oil overflow the first time the burner is operated.

Product Pump Packing Gland Replacement

a. Perform the following procedures to replace the product pump packing gland.

b. Loosen the two bolts that hold the split retainer on the product pump shaft.



c. Remove the two bolts, and move the split retainer as far to the right as possible to allow access to the shaft packing.

CAUTION: DO NOT SCRATCH THE PUMP SHAFT WHEN REMOVING THE OLD SHAFT PACKING. A DAMAGED SHAFT CAUSES EXCESSIVE PACKING WEAR AND LEAKAGE.

d. Use an awl or scribe to remove the packing from the pump shaft. Make sure all the old packing is removed from the packing recess.

e. Repack the pump shaft with clean, new packing material. Use only BearCat Part No. RNG-80054.

f. Position the split retainer over the new packing and install the two retainer bolts finger-tight.

g. Perform sealant heating and circulation operations in accordance with the procedures given in SECTION 3. PREPARING EQUIPMENT FOR USE.

CAUTION: DO NOT OVER-TIGHTEN THE SPLIT RETAINER BOLTS. ONLY SNUG-TIGHTEN THE BOLTS. OVER-TIGHTENED BOLTS WILL CAUSE THE PACKING TO SCORE THE PUMP SHAFT.

h. With the machine at normal operating temperature and the product pump rotating, carefully snug-tighten the split retainer bolts.

CAUTION: ADJUST THE PUMP PACKING DAILY. THE PACKING MUST LEAK ONE (1) DROP PER MINUTE FOR SHAFT LUBRICATION.

i. Periodically snug-tighten the split retainer bolts as excess seepage appears at the product pump shaft during operation.

Hot-Oil Pump Packing Gland Replacement

Perform the following procedures to replace the hot-oil pump packing gland.

a. Loosen the two bolts that hold the retainer on the hot-oil pump shaft.

b. Remove the two bolts and lift the retainer up to allow access to the hot-oil pump shaft packing.

CAUTION: DO NOT SCRATCH THE PUMP SHAFT WHEN REMOVING THE OLD SHAFT PACKING. A DAMAGED SHAFT CAUSES EXCESSIVE PACKING WEAR AND LEAKAGE.

c. Use an awl or scribe to remove the packing from the pump shaft. Make sure all the old packing is removed from the packing recess.

d. Repack the pump shaft with clean, new packing material. Use only BearCat Part No. RNG-80297.

e. Position the retainer over the new packing and install the two retainer bolts finger-tight.

f. Perform hot-oil heating and circulation operations in accordance with the procedures given in SECTION 3. PREPARING EQUIPMENT FOR USE.

CAUTION: DO NOT OVER-TIGHTEN THE RETAINER BOLTS. ONLY SNUG-TIGHTEN THE BOLTS. OVER-TIGHTENED BOLTS WILL CAUSE THE PACKING TO SCORE THE PUMP SHAFT.

g. With the hot-oil at normal operating temperature and the hot-oil pump rotating, carefully snug-tighten the retainer bolts.

CAUTION: ADJUST THE PUMP PACKING DAILY. THE PACKING MUST LEAK ONE (1) DROP PER MINUTE FOR SHAFT LUBRICATION.

h. Periodically snug-tighten the retainer bolts as excess seepage appears at the hot-oil pump shaft during operation.

Recommended Fluids

The heat-transfer oils (hot-oil) listed in Table 5-4 are suitable for use in BK series crack sealing machines. Oils other than those listed may be acceptable provided they meet the general specifications.

The heat-transfer oil used in BK series crack sealing machines must be a solvent-extracted, thoroughly dewaxed, clay-filtered, paraffin-based oil recommended for operating temperatures up to 600 °F (316 °C) in a closed, forced circulation system.

Table 5-4. Suitable Heat-Transfer Oils

MANUFACTURER	PRODUCT NAME	PRODUCT NO.
Chevron USA	Heat Transfer Oil	1
CONOCO, Inc.	Heat Transfer Oil	-
Gulf Oil Corp.	Gulftherm	68
Mobil Oil Corp.	Mobiltherm	603
Shell Oil Corp.	Thermia Oils	C
Diamond Shamrock	Heat Transfer Oil	-
Sun Oil Co.	Heat Transfer Oil	25
Texaco, Inc.	Texatherm	46
Union Oil Co.	Redline Series	225

Heat-Transfer Oil Specification

Table 5-5 lists the general specification for heat-transfer oil suitable for use in BK series crack sealing machines.

Table 5-5. Heat-Transfer Oil Specification

CATEGORY	SPEC	CATEGORY	SPEC
Gravity, API	30	Carbon Residue, wt %	0.10
Flash Point	440 °F	Pour Point	5 °F
Viscosity @ 100 °F (38 °C)	110	Distillation Range, 50%	780 °F
Viscosity @ 210 °F (99 °C)	40	Specific Gravity @ 500 °F (260 °C)	0.67
Viscosity Index	95	Specific Heat @ 500 °F (260 °C)	0.70

NOTE: Aromatic or high temperature flash point lubricating oils MUST NOT BE MIXED with paraffin base heat-transfer oils.

Hydraulic Fluid

Premium quality hydraulic oil such as Union Unax AW or equivalent is recommended. For minimum ambient temperature below 32 °F (0 °C), use SAE 10W (150-215 SUS grade). Above 32 °F (0 °C), use SAE 20-20W (315 SUS grade).

Troubleshooting

Table 5-6 is provided as a guide to assist the user in the maintenance and troubleshooting of the BK Series All-Diesel Kracker.

Table 5-6. Troubleshooting

SYMPTOM	POSSIBLE CAUSE	SOLUTION
Heat-transfer oil (hot-oil) is slow to heat	1. Insufficient hot-oil in system. 2. Hot-oil is contaminated or aged. 3. Temperature gauge out of calibration.	1. Check hot-oil level. Add oil as necessary. 2. Remove sample for testing or drain system and install new oil. Refer to procedures and specifications in this section. 3. Replace or recalibrate temperature gauge.
Burner does not light	Insufficient pressure in sealant heating system due to: 1. Hot-oil pump inoperative. 2. Low hot-oil level. 3. Hot-oil bypass valve open. 4. Hydraulic valve closed.	1. Check hot-oil pump; repair or replace. 2. Check hot-oil level. Add oil as necessary. 3. Close valve. See procedure in SECTION 3. 4. Open hydraulic valve.
Burner does not shut off:	Component malfunction or misadjustment.	Shut off burner manually with burner switch on control panel. Consult factory for corrective action.
When sealant temperature reaches control setting.		
When hot-oil temperature exceeds 525 °F.		Call Bearcat Service Dept. 928-684-7851
When diesel engine stops.		
Diesel engines stalls or runs poorly	Malfunction or mis-adjustment in engine.	Refer to engine manufacturer's literature.

Table 5-6. Troubleshooting (cont.)

Circulating augers do not rotate	1. Auger directional control set too low. 2. Cold sealant. 3. Lack of hydraulic pressure, due to: a. Insufficient hydraulic fluid. b. Hydraulic valve closed. c. Malfunction in hydraulic pump, motor or directional control valve.	1. Increase to higher setting. 2. Allow sealant to heat. 3. a. Check fluid level. Add fluid as necessary. b. Open hydraulic valve. c. Check components, repair as necessary. Consult factory technical support.
Product pump does not rotate	1. Cold sealant. 2. Lack of hydraulic pressure, due to: a. Insufficient hydraulic fluid. b. Hydraulic valve closed. c. Malfunction in hydraulic pump, motor or directional control valve. 3. Malfunction in product pump.	1. Allow sealant to heat. 2. a. Check fluid level. Add fluid as necessary. b. Open hydraulic valve. c. Check components, repair as necessary. Consult factory technical support. 3. Check product pump and repair or replace. Refer to manufacturer's literature.
Sealant material does not flow	1. Cold sealant. 2. Application/recirculation valve setting incorrect. 3. Clog in application wand or hose. 4. Damaged or worn valves. 5. Worn product pump.	1. Allow sealant to heat. 2. Refer to PREPARING EQUIPMENT FOR USE. Heating/Circulating Sealant. 3. Allow wand and hose assembly to heat in hose trough until wand circulates. 4. Repair or replace as necessary. Consult factory technical support. 5. Replace product pump.
Hot-oil pump does not rotate	1. Hot-oil bypass valve open. 2. Malfunction in pump or hydraulic motor.	1. Close hot-oil bypass valve. 2. Repair or replace as necessary. Consult factory technical support.

ILLUSTRATED PARTS LIST

The following recommended spare parts list (Table 6-1) is provided as a guide to the user for convenience in the maintenance of BK series crack sealing machines. All of the parts listed are available from BearCat Manufacturing, Inc.

Table 6-1. Recommended Spare Parts

DESCRIPTION	PART NO.	QTY
Engine Oil Filter	FTR-80932	1
Engine Air Filter	FTR-80934	1
Diesel Fuel Filter – Engine Element	FTR-80930	1
Hydraulic Filter Element	FTR-22502	1
Product Pump Packing	RNG-80054	1
Hot-Oil Pump Packing	RNG-80297	1 set
Application Hose with Fittings (Hose Trough)	MSC-80418-Y	1
Application Hose with Fittings (Hose Box)	PIP-80415	1
Wand Handle with Ball Valve	VLV-27084	1
Coupling Chain (only)	FIT-80017	1
Burner Nozzle, 2.25-60°	FIT-80686	1
Bus Bar Support	BRK-81182	1
Fuel Pump Coupling	208731	1

The BK-250D Kracker and the BK-400D Kracker are similar in design and operation. The BK-250D Kracker is used for most of the figures in the Illustrated Parts List. Differences are noted in the parts list or difference drawings are provided in the applicable figure.

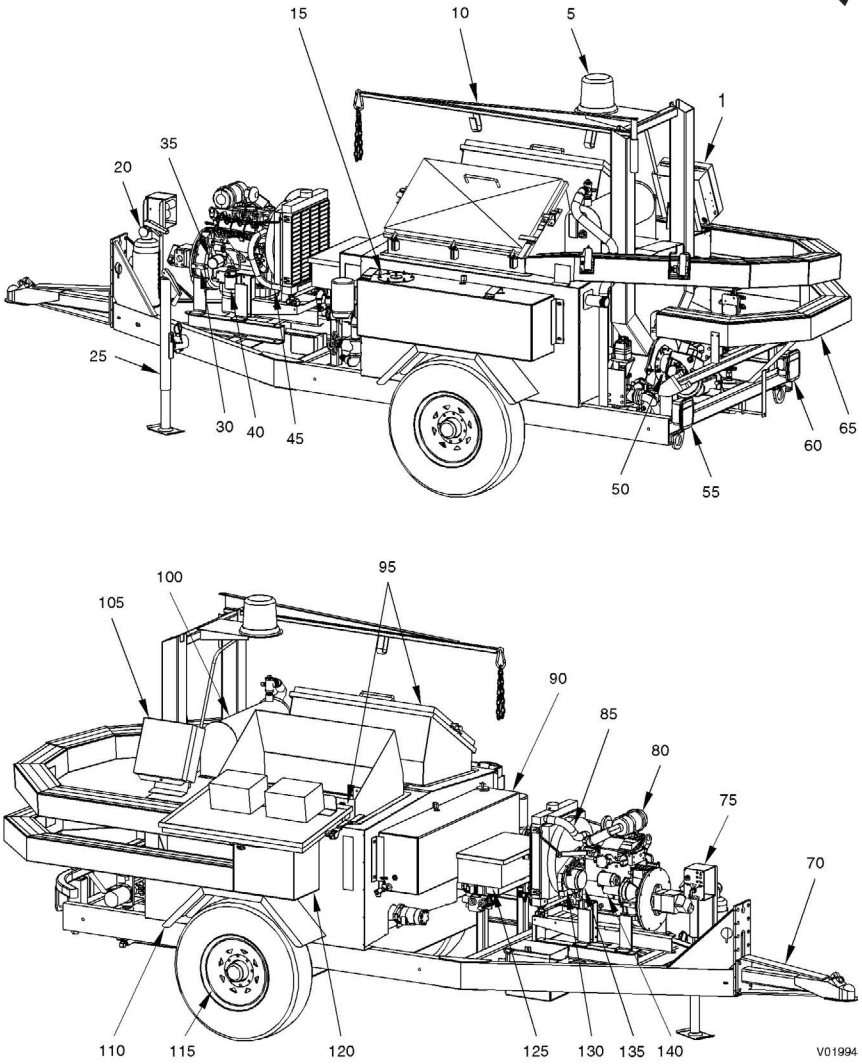


Figure 6-1 BK-250D Kracker

FIG 6-1			
ITEM	**DESCRIPTION**	**PART NO.**	**QTY**
1	Kracker (complete)	ASM-82250	RF
5	Beacon, Rotating	ELC-24215	1

10	Hose Jib	BRK-80365	1
15	Hydraulic Tank (BK-250D)	TNK-80242	1
	Hydraulic Tank (BK-400D)	TNK-80241	1
20	Fire Extinguisher, 10-lb	MSC-80009	1
25	Jack, 5,000-lb	MCH-80104	1
30	Diesel Engine, Isuzu (3CBI/CZ P01)	200073	1
35	Filter, Oil (3LB1-EAO1)	FTR-20940	1
40	Filter, Fuel (3LB1-EAO1)	FTR-20942	1
45	Radiator Hose, Bottom (3LBI)	PIP-81019	1
50	Diesel Burner Assembly	PTM-80690	1
55	Tail Light, Left-Hand	ELC-24207	1
60	Tail Light, Right-Hand	ELC-24206	1
65	Heated Hose Trough (BK-250D)	HSG-80531	1
	Heated Hose Trough (BK-400D)	HSG-80530	1
	• Clamps, Heated Hose Trough	HSG-80533	AR
	• Rubber 1/8 in. X 3 1/4 in.	MSM-80538	AR
	• Hot-Oil Tube, Upper (BK-250D)	HSG-80564	1
	Hot-Oil Tube, Upper (BK-400D)	HSG-81211	1
	• Hot-Oil Tube, Lower (BK-250D)	HSG-80563	1
	Hot-Oil Tube, Lower (BK-400D)	HSG-81210	1
70	Hitch, Extended, 2 5/16 in. Ball	FAS-80126	1
75	Control Panel Assembly W/Gages	HSG-80147	1
80	Filter, Air (3LB1-EAO1)	FTR-20941	1
85	Radiator Hose, Top (3LBI)	PIP-81020	1
90	Diesel Tank (BK-250D)	TNK-80243	1
	Diesel Tank (BK-400D)	TNK-80244	1
95	Sealant Loading Door Assembly	HSG-80271	2
100	Hot-Oil Expansion Tank	TNK-71201	1
105	Control Box Assembly (see Figure 6-8)	HSG-81019	1
110	Fender (BK-250D)	GRD-81069	2
	Fender (BK-400D)	GRD-81060	2
115	Rim, White	MSC-80126	AR
120	Insulated Box	HSG-49896	1
125	Tool Box	HSG-80030	1
130	Fan Belt	MSC-80652	1
135	Alternator	MSC-80656	1
140	Starter (3BI)	MSC-80622	1

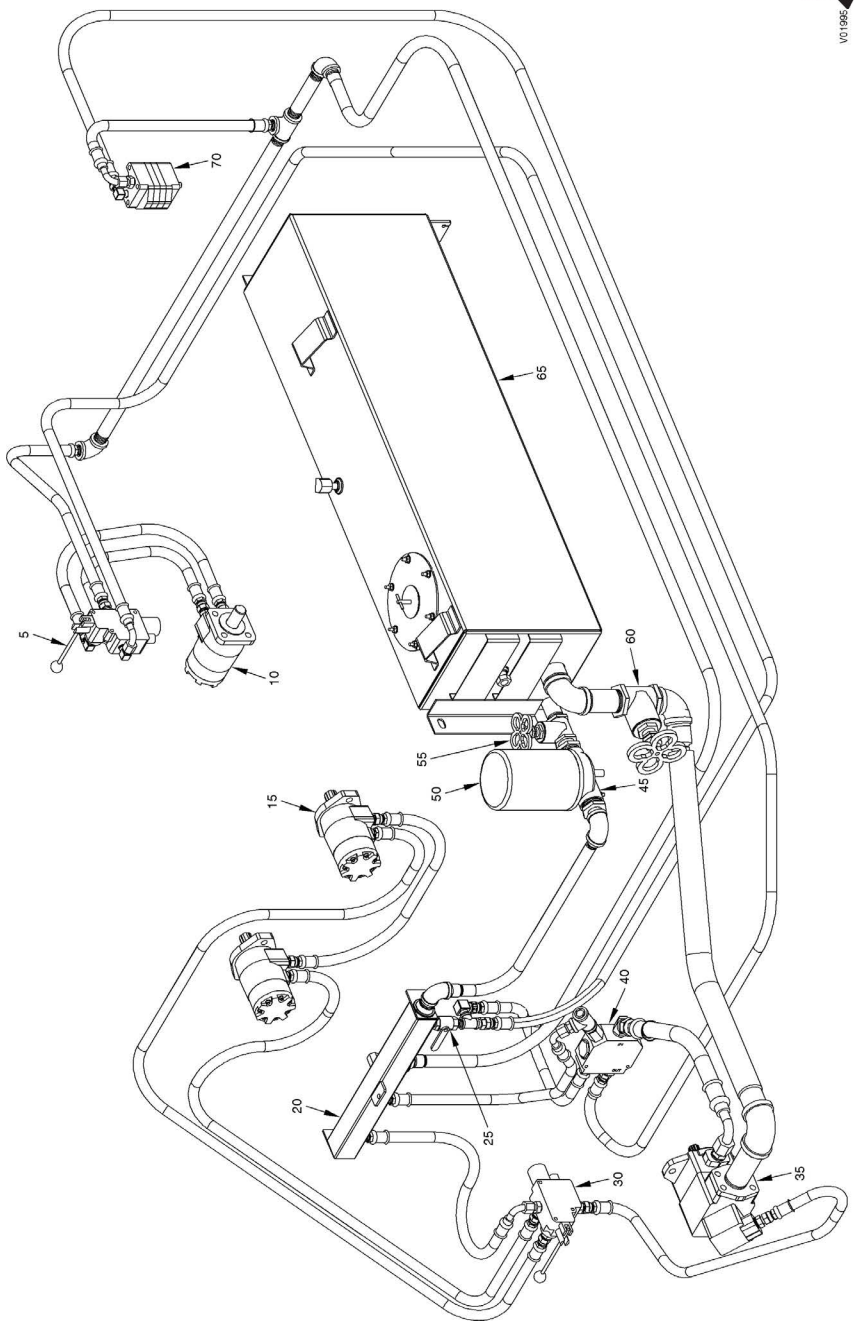


Figure 6-2. Kracker Hydraulic System

FIG 6-2 HYDRAULIC SYSTEM			
ITEM	**DESCRIPTION**	**PART NO.**	**QTY**
5	Valve, Directional Control	VLV-80005	1
10	Hydraulic Motor, Product Pump	PMP-80309	1
15	Auger Motor	PMP-80355	2
20	Hydraulic Manifold	MSC-81015	1
25	Valve, 3/8 in. Ball	VLV-29202	1
30	Valve, Directional Control	VLV-80005	1
35	Hydraulic Pump (V2010)	PMP-80002	1
40	Priority Valve	VLV-80004	1
45	Filter Base	FTR-22503	1
50	Filter, Hydraulic	FTR-22502	1
55	Valve, 1 in. Gate	VLV-29242	1
60	Valve, 1 1/2 in. Gate	VLV-29260	1
65	Hydraulic Tank (BK-250D)	TNK-80242	RF
	Hydraulic Tank (BK-400D)	TNK-80241	RF
70	Hydraulic Motor, Transfer-Oil (Hot-Oil) Pump	PMP-80990	1

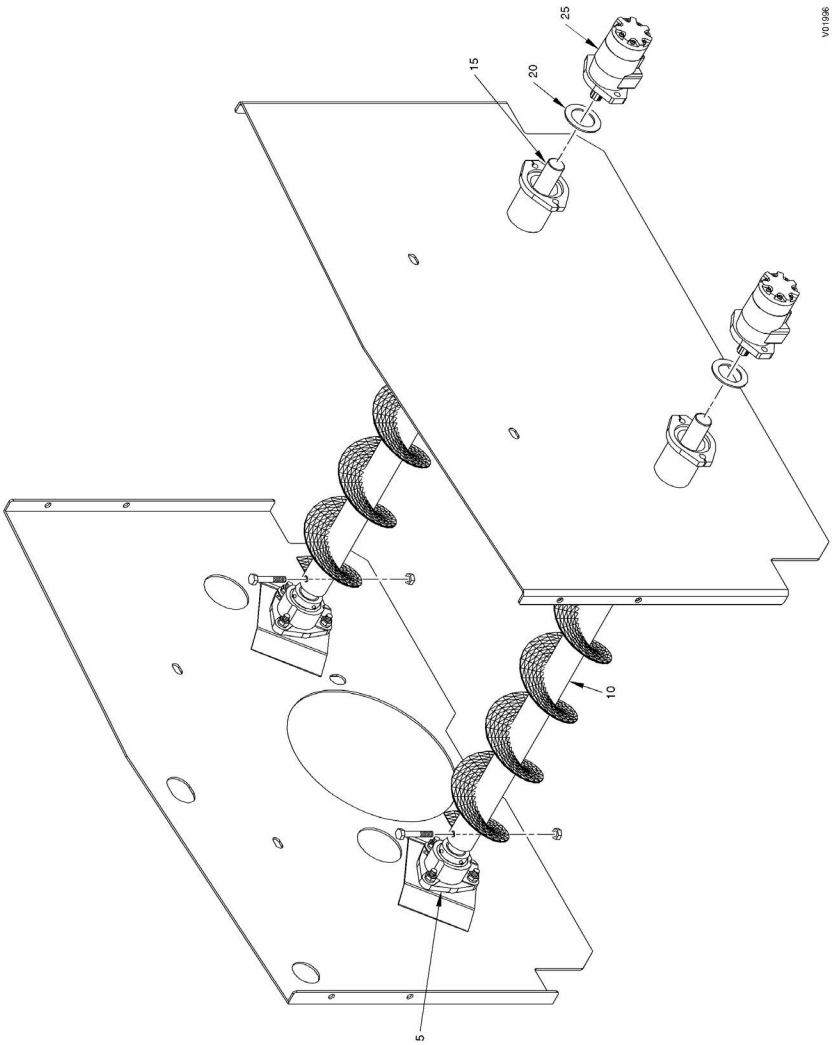


FIGURE 6-3 CIRCULATING AUGER ASSEMBLY			
ITEM	**DESCRIPTION**	**PART NO.**	**QTY**
5	Bearing	PTM-80353	2
10	Auger 8 in. (BK-250D)	MCH-80344	2
	Auger 8 in. (BK-400D)	MCH-80431	2
15	Auger Shaft (BK-250D)	PTM-80345	2
	Auger Shaft (BK-400D)	PTM-80425	2
20	Gasket	RNG-29054	2
25	Auger Motor	PMP-80355	RF

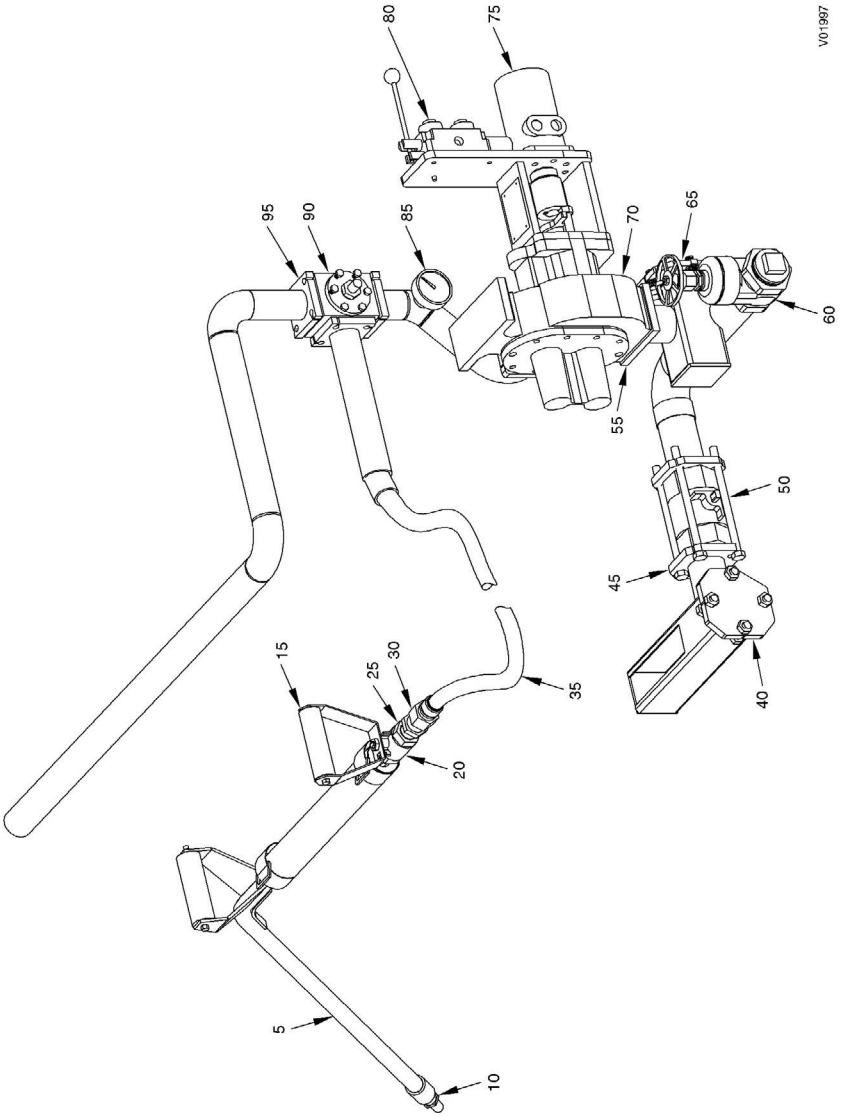


FIGURE 6-4 CIRCULATION PLUMBING			
ITEM	**DESCRIPTION**	**PART NO.**	**QTY**
5	Application Wand Assembly	MSC-80409	1
10	• Wand Tip (Steel)	MSC-80408	1
15	• Handle	GRD-27083	1
20	• Valve, Wand	VLV-29229	1
25	• Quick Connect, Male	FIT-29741	1
30	• Quick Connect, Female	FIT-29740	1

35	Application Hose (Hose Trough)	MSC-80418-Y	1
	Application Hose (Hose Box)	PIP-80415	1
40	Gasket	RNG-29046	1
45	Gasket, 2 in.	RNG-29054	2
50	Valve, Tank	VLV-29272	1
55	Gasket, 2 in.	RNG-29054	2
60	Valve, Drain	VLV-29270	1
65	Strainer, Kracker	HSG-80234	1
	• Screen, Strainer	FTR-80222	1
	• Gasket	RNG-29046	1
70	Product Pump, BC-110 (see Figure 6-5)	PMP-81108	1
75	Hydraulic Motor, Product Pump	PMP-80309	1
80	Valve, Directional Control	VLV-80005	1
85	Product Temperature Gauge	MTR-80311	1
90	Application/Recirculation Valve	VLV-80050	1
95	Gasket, 1 1/2 in.	RNG-29047	3

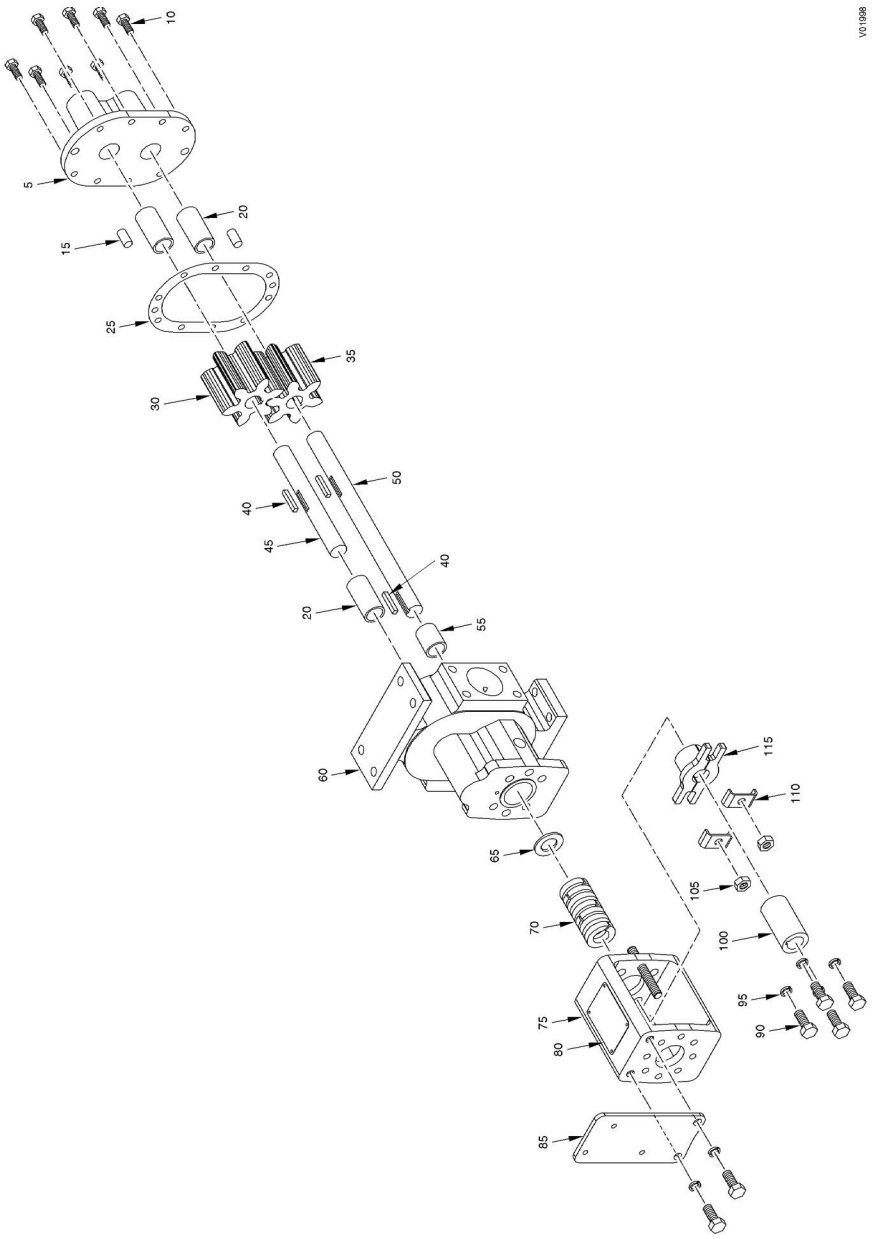


Figure 6-5. Product Pump

FIGURE 6-5 PRODUCT PUMP, BC-110			
ITEM	**DESCRIPTION**	**PART NO.**	**QTY**
5	Face Plate	HSG-31051	1
10	Hex Bolt 3/8 in. – 16 X 1 in.	FAS-28731	8
15	Dowel Pin	FAS-33655	2
20	Bushing, Long	PTM-74011	3
25	Gasket	RNG-29994	1
30	Gear, Right-Hand	PTM-30005	1
35	Gear, Left-Hand	PTM-30004	1
40	Key, 0.25 in. X 0.25 in. X 1.5 in.	PTM-31003	3
45	Shaft, Pump Idler	PTM-31002	1
50	Shaft, Pump Drive	PTM-31001	1
55	Bushing, Short	PTM-74012	1
60	Housing	HSG-31050	1
65	Washer, Packing	FAS-80294	1
70	Packing	RNG-80058	1
75	Bracket, BC-110 Motor/Valve	BRK-80315	1
80	Plate, Warning	MSM-33710	1
85	Mount, Valve	BRK-80319	1
90	Hex Bolt 1/2 in. – 13 X 1 in.	FAS-28760	6
95	Washer, Lock 1/2 in.	FAS-28649	6
100	Coupling	PTM-80310	1
105	Nut, Hex 1/2 in. – 13	FAS-28504	2
110	Retainer	BRK-80011	2
115	Packing Gland	PMP-33740	1

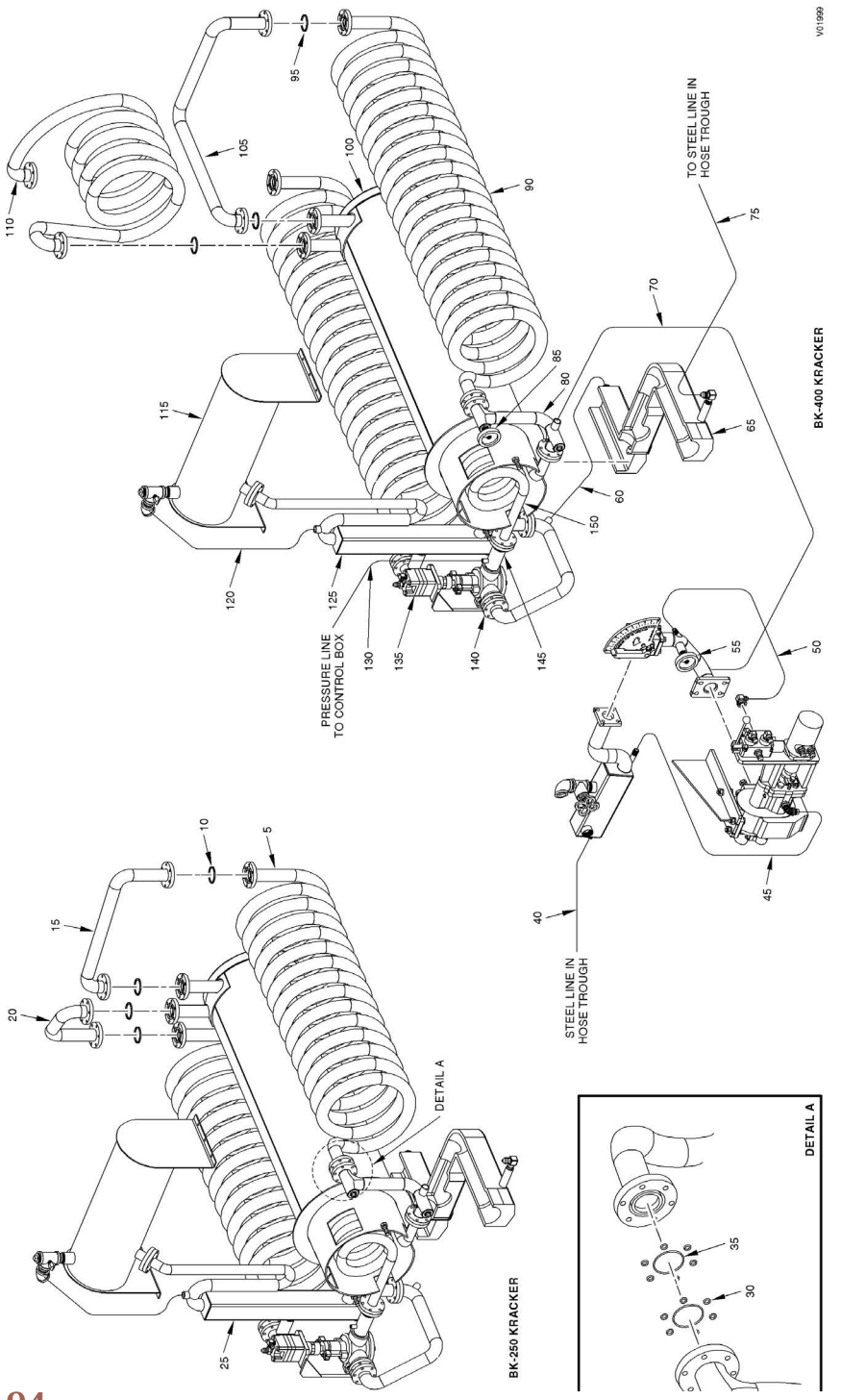

V01999
BK-400 KRACKER
BK-250 KRACKER
DETAIL A
TO STEEL LINE IN HOSE TROUGH
PRESSURE LINE TO CONTROL BOX
STEEL LINE IN HOSE TROUGH
5
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FIGURE 6-6 HOT-OIL SYSTEM			
ITEM	**DESCRIPTION**	**PART NO.**	**QTY**
5	Coiling (BK-250D)	MSC-71207	2
10	O-Ring, Viton (BK-250D)	RNG-71032	9
15	Line, Cross-Over (BK-250D)	MSC-71214	1
20	Feed Line, Cross-Over (BK-250D)	MSC-71215	1
25	Hot-Oil Return and Suction Assembly (BK-250D)	MSC-71202	1
30	O-Ring, Bolt-to-Flange	RNG-71031	24
	Washer	FAS-28618	12
35	O-Ring, Viton	RNG-71032	4
40	Steel Line (Hose Trough)		AR
45	S/S Hose 3/8 in. X 18 in.	MSC-80371	1
50	S/S Hose 3/8 in. X 18 in.	MSC-80371	1
55	Product Temperature Gauge	MTR-80311	RF
60	S/S Hose 3/8 in. X 18 in.	MSC-80371	1
65	Manifold, Lower	MSC-80391	1
70	S/S Hose 3/8 in. X 1.04 ft	MSC-80370	1
75	S/S Flex Hose 34 in.	MSC-82080	1
80	Coiling Supply Line	MSC-71206	1
85	Hot-Oil Temperature Gauge	MTR-80311	1
90	Coiling (BK-400D)	MSC-71208	2
95	O-Ring, Viton (BK-400D)	RNG-71032	11
100	Flue	HSG-71209	1
105	Line, Cross-Over (BK-400D)	MSC-71216	1
110	Coiling, Extension (BK-400D)	MSC-71212	1
115	Hot-Oil Expansion Tank	TNK-71201	RF
120	Vent Line (3/8 in. Brake Line)		AR
125	Hot-Oil Return and Suction Assembly (BK-400D)	MSC-71217	1
130	Pressure Line to Control Box (3/8 in. Brake Line)		AR
135	Hot-Oil Motor Assembly	MSC-71205	1
140	Hot-Oil Pump Suction Line	MSC-71203	1
145	Adaptor, Outlet	MSC-71204	1
150	Coiling, Heat Flue	MSC-71025	1

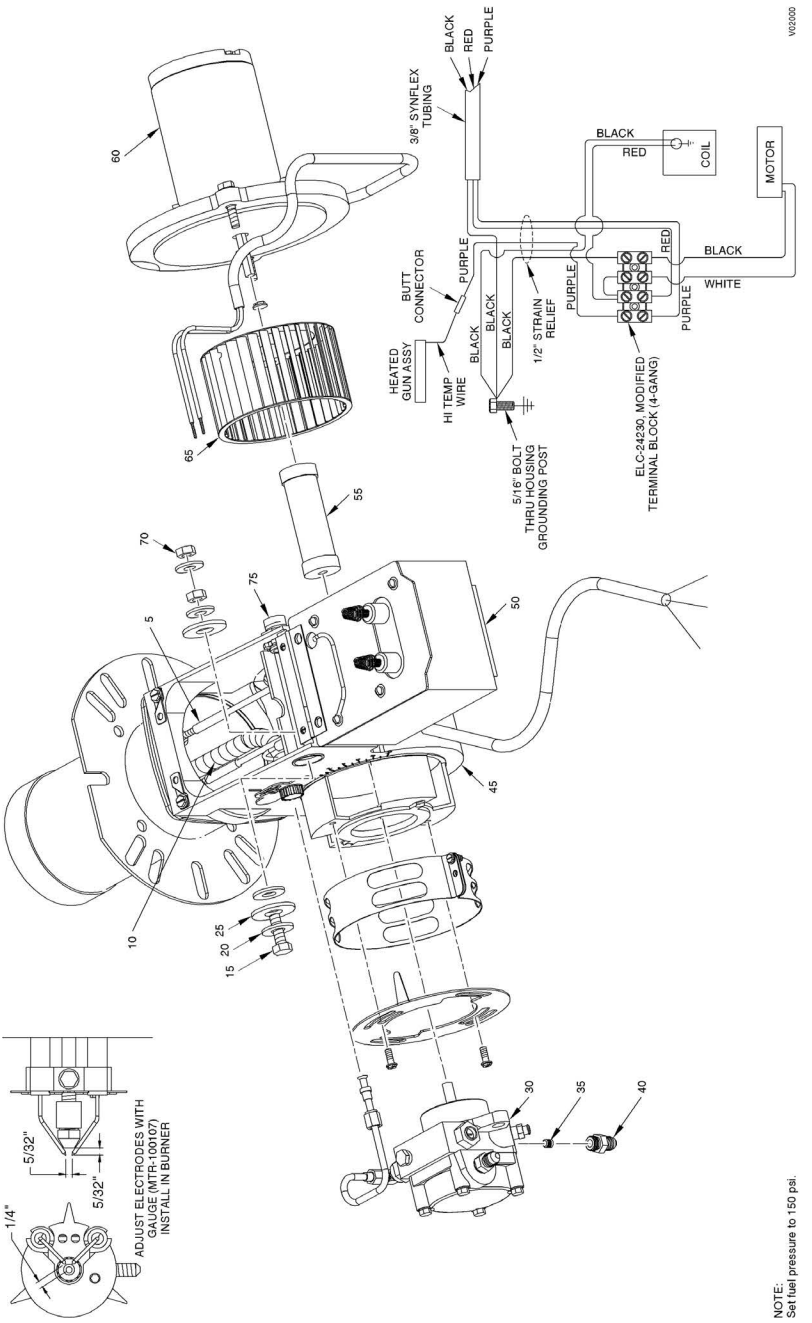


Figure 6-7 Diesel Burner Assembly

FIGURE 6-7 DIESEL BURNER ASSEMBLY			
ITEM	**DESCRIPTION**	**PART NO.**	**QTY**
	Diesel Burner Assembly	PTM-80690	RF
5	Electrodes	ELC-24954	1
10	Gun Assembly, Modified • Fuel Spray Nozzle	ELC-80683 FIT-80686	1 1
15	Hex Bolt 5/16 in. – 18 X 1 in.	FAS-28716	1
20	Washer, Flat 5/16 in.	FAS-28633	4
25	Washer, Flat 7/16 in.	FAS-28635	2
30	Fuel Pump	PMP-81058	1
35	Soc. Hd. Pipe Plug 1/16 in.	Provided W/Burner	1
40	Fitting	4MJ-4MP	2
45	Burner Assembly, Modified, 2.5 gal/hr	PTM-80690	1
50	Ignition Coil W/Lid (custom)	ELC-80699	1
55	Coupler, Pump/Fan	208731	1
60	Electric Motor, Modified	ELC-80696	1
65	Blower Cage	MCH-80690	1
70	Nut, Hex 5/16 in. – 18	FAS-28501	2
75	Strain Relief 1/2 in.	ELC-24421	1

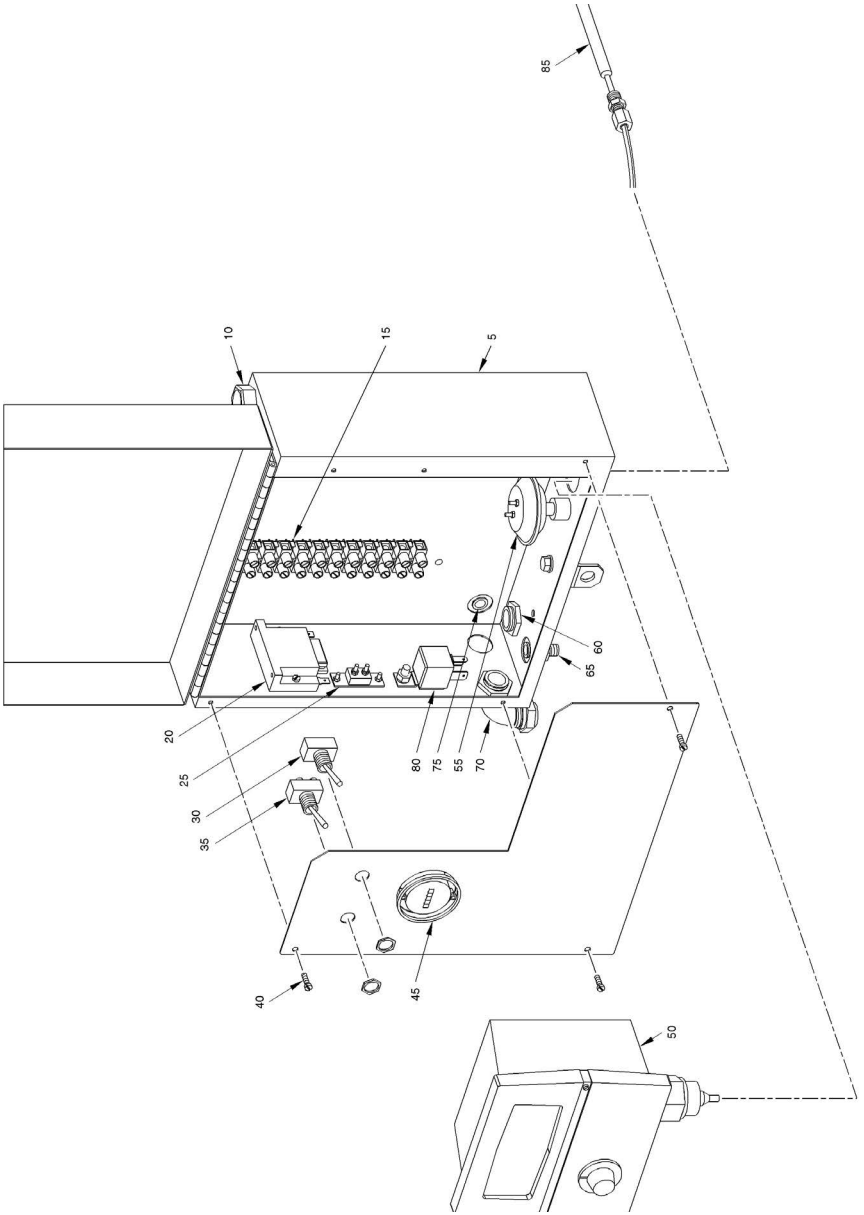
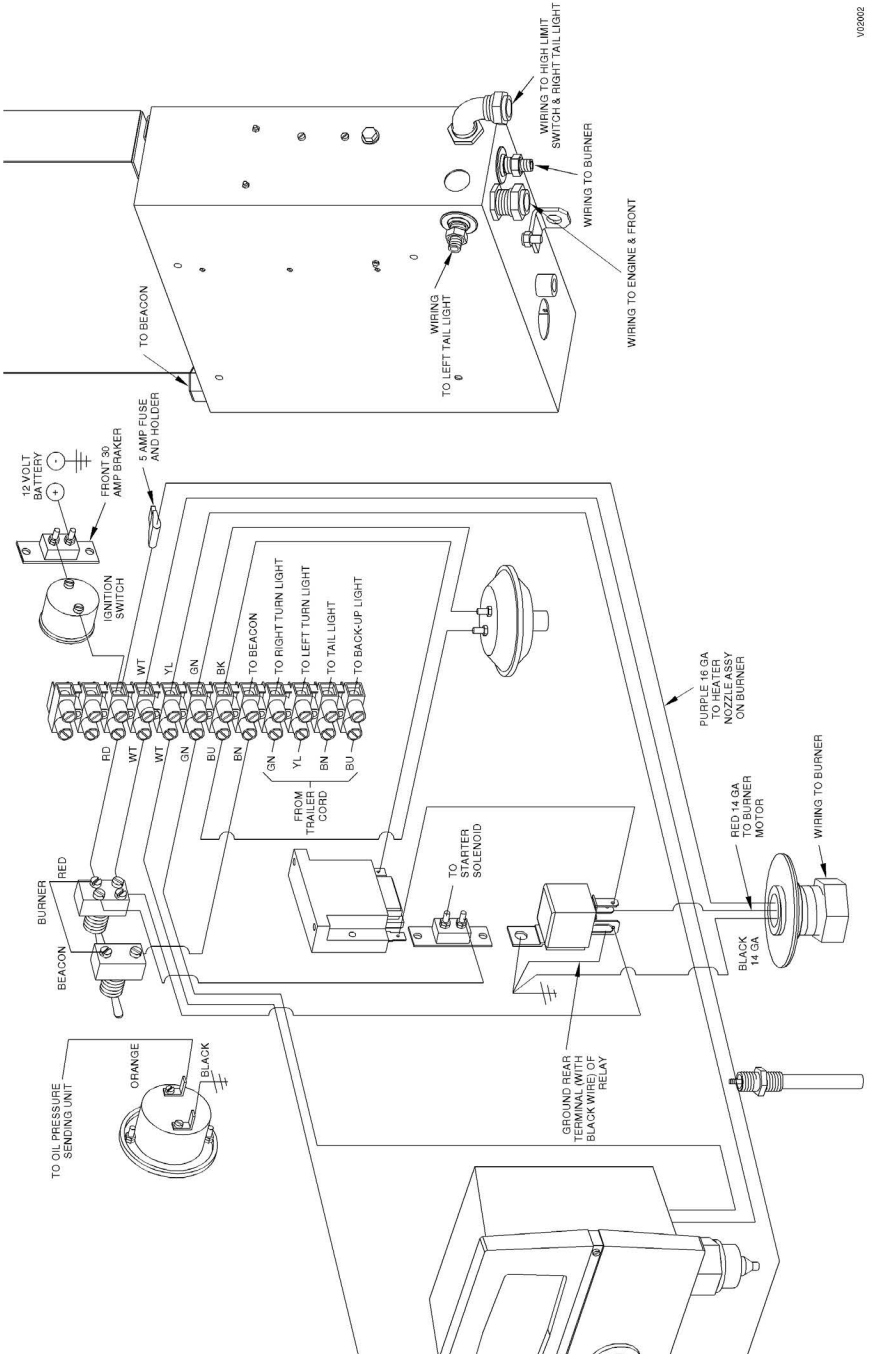
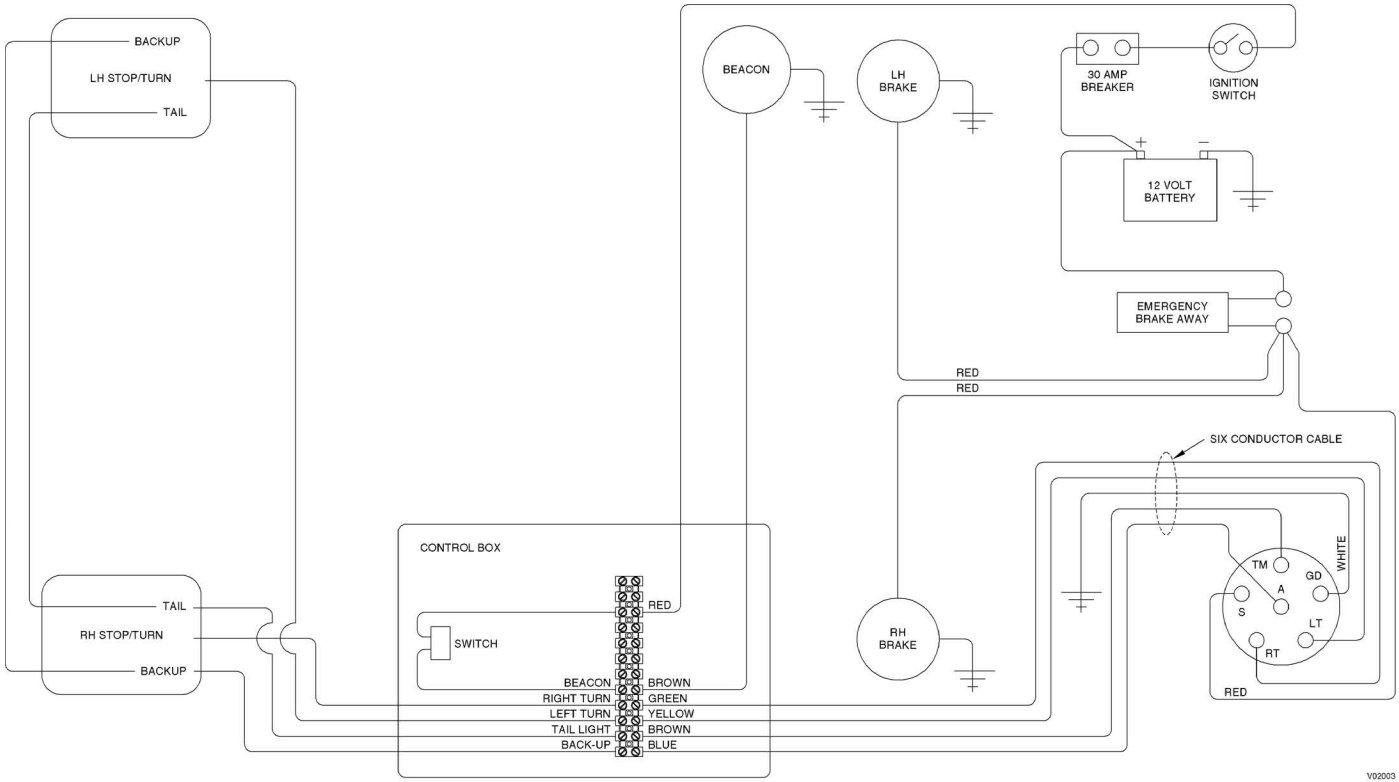


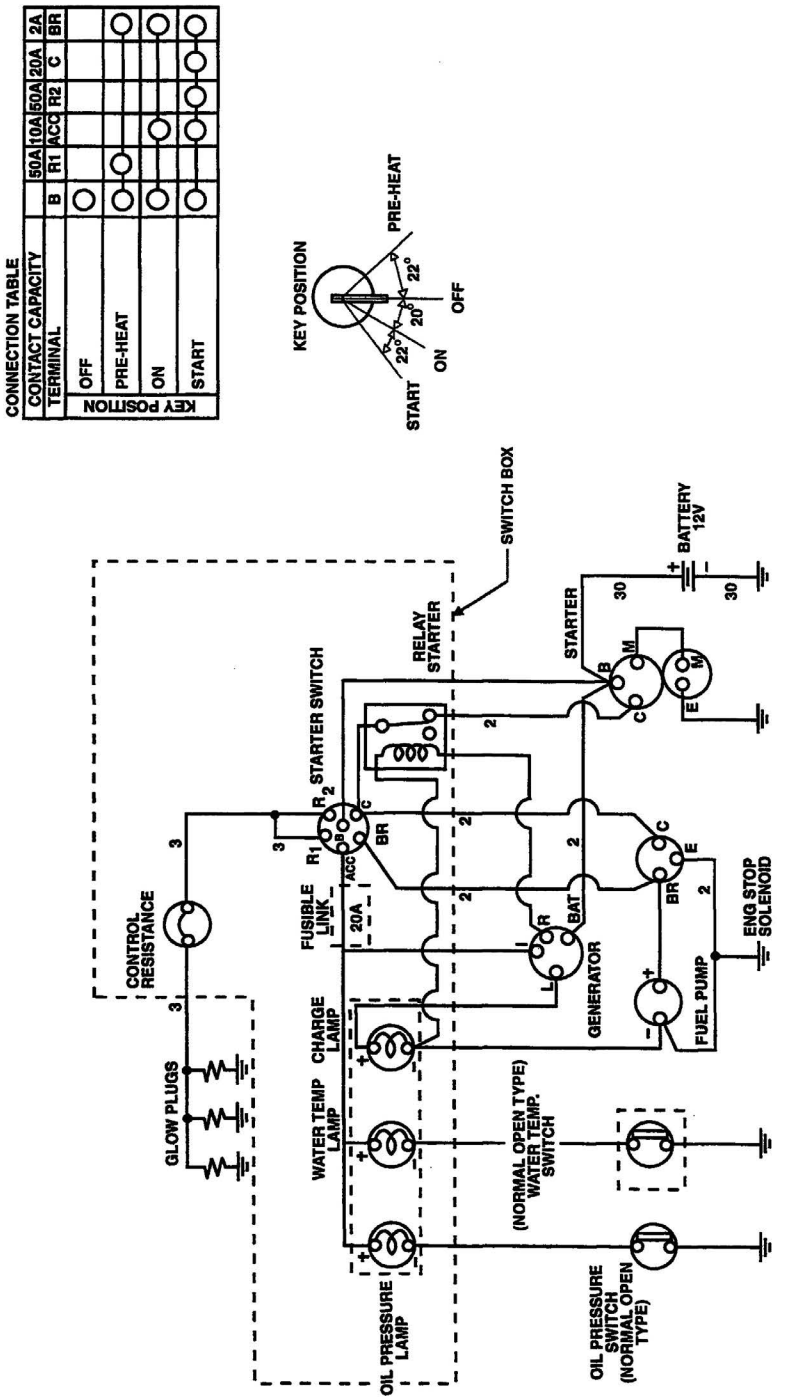
FIGURE 6-8 CONTROL BOX ASSEMBLY			
ITEM	**DESCRIPTION**	**PART NO.**	**QTY**
	Control Box Assembly	HSG-81019	RF
5	Control Box	HSG-81017	1
10	Conduit Connector 1/2 in. NPT – 1/2 in.	ELC-24408	1

15	Terminal Block 12-Gang	ELC-24230	1
	Screw 8 – 32 X 3/4 in.	FAS-25814	3
	Nut, Hex 8 – 32	FAS-28552	6
20	Timer Capsule	ELC-80427	1
	Screw 6 – 32 X 1/2 in.	FAS-25760	2
	Nut, Hex 6 – 32	FAS-28551	2
25	Circuit Breaker, 30 Amp	ELC-24290	1
	Screw 6 – 32 X 1/2 in.	FAS-25760	2
	Nut, Hex 6 – 32	FAS-28551	2
30	Switch, Single Pole ON-OFF	ELC-24275	1
35	Switch, Double Pole ON-OFF	ELC-24267A	1
40	Screw 10 X 1/2 in.	FAS-25833	3
45	Hour Meter	MTR-80712	1
50	Temperature Control W/Probe	MTR-80702	1
55	Pressure Switch	ELC-80705	1
60	Adapter, 1/2 in. NPT – 1/2 in. Flex	ELC-24425	1
65	Fitting	6CT-4MP	1
70	Adapter, 1/2 in. NPT – 1/2 in. Flex 90-Degree	ELC-24435	1
75	Fitting	6CT-4MP	1
80	Relay, 70 Amp	ELC-24270	1
	Hex Bolt 1/4 in. – 20 X 3/4 in.	FAS-28701	1
	Washer, Flat 1/4 in.	FAS-28632	1
	Washer, Lock 1/4 in.	FAS-28645	1
	Nut, Hex 1/4 in. – 20	FAS-28500	1
85	Temperature Control Probe	MTR-80702A	1

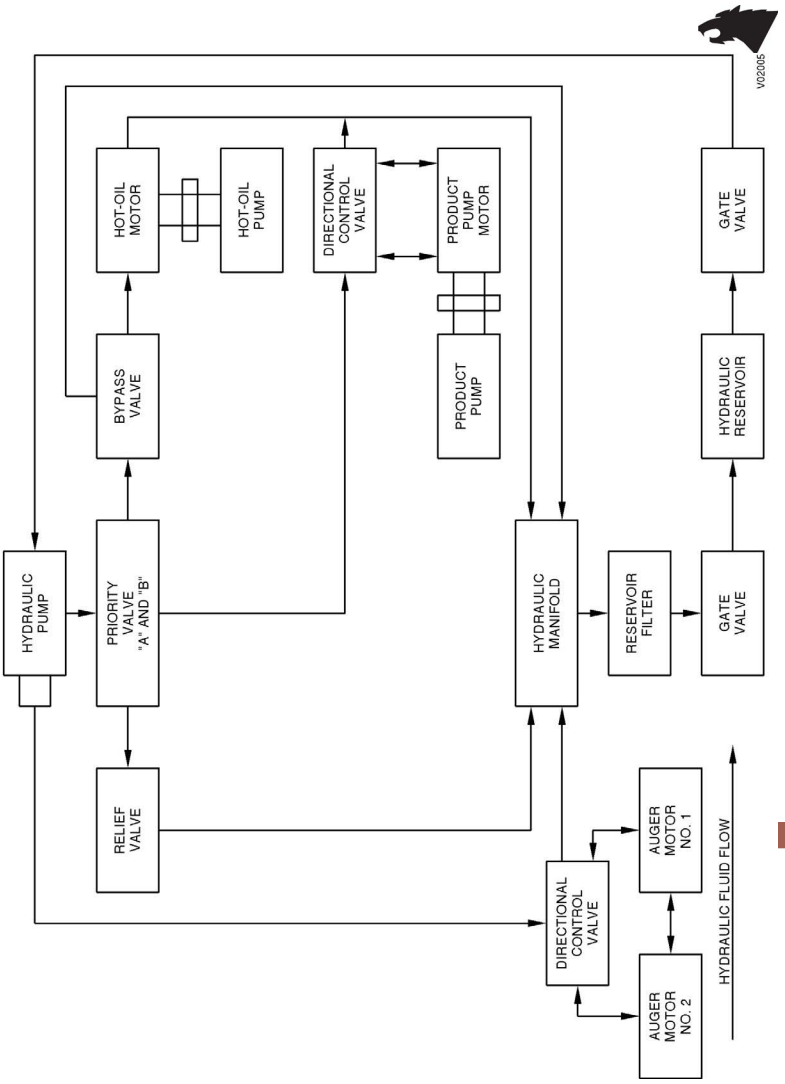


Control Box Schematic


BACKUP
LH STOP/TURN
TAIL
TAIL
RH STOP/TURN
BACKUP
CONTROL BOX
SWITCH
RED
BEACON
BROWN
RIGHT TURN
GREEN
LEFT TURN
YELLOW
TAIL LIGHT
BROWN
BACK-UP
BLUE
BEACON
LH BRAKE
RH BRAKE
30 AMP BREAKER
IGNITION SWITCH
12 VOLT BATTERY
EMERGENCY BRAKE AWAY
RED
RED
SIX CONDUCTOR CABLE
TM
GD
A
S
LT
RT
WHITE
RED
V02003



Diesel Engine Schematic



Hydraulic System Flow Diagram